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CHALLENGER

The Life of a Survey Ship

(*Frontispiece*)

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CHALLENGER

The Life of a Survey Ship

by
GEORGE STEPHEN RITCHIE
Captain, Royal Navy

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Preface

BY VICE-ADMIRAL SIR GUY WYATT, K.B.E., C.B.
Hydrographer of the Navy 1945-1950

I AM so glad that Captain Ritchie has written this book and I am sure that all who read it will agree that he has made a first-class job of it.

I am also happy that he has asked me to write a Preface because it gives me the chance to say a few words in memory of this well-loved ship and to my old shipmates.

During her twenty-two years of life *Challenger* saw the final passing of the old methods of survey and the firm establishment of the new for, though she was fitted with echo sounding gear on her first commission, it was still experimental and often unreliable so that much work was done with the lead; her boats relied entirely on this ancient means of sounding; fixing position depended on good visibility. At the close of her career echo sounding was used exclusively both in the ship and her boats, the lead being relegated to one means of obtaining samples of the bottom; the fixing of position no longer depended entirely on sight, for various electronic devices made fixing possible under any conditions.

Nowadays nothing but human limitations or a gale of wind need prevent the surveyor sounding both day and night for weeks on end! A most alarming thought for all of us who used to look forward to a day of rain or fog to allow us to catch up with office work or just have a 'caulk'.

Nearly all those mentioned in this book were shipmates with me in *Challenger* or other surveying ships or in the Department; some, alas, are no more. It has been a great pleasure to read of their adventures and to recall the times we spent together. So I will end this Preface by saying to them, 'Old Ships—Here's to the memory of our old ship and to old shipmates who have passed on!'

Holly Tree Orchard,
Woodbridge, Tasmania
June 1957

Contents

Chap.		*Page*
	Foreword: 'A Famous Name'	xiii
I.	The New Ship	1
II.	Labrador	10
III.	Windward Isles and the Grenadines	24
IV.	The Winter Party	35
V.	Spring in the North	51
VI.	The West Indies	60
VII.	Sandy Shores	73
VIII.	Iceland	83
IX.	War at Sea	98
X.	Gambia River	113
XI.	The Eastern Fleet	125
XII.	Torres Straits	146
XIII.	The Persian Gulf	156
XIV.	Cyprus Interlude	178
XV.	World Voyage Begins	185
XVI.	The Pacific	201
XVII.	Atolls	214
XVIII.	The Deepest Depths	225
XIX.	Homeward	233
	Appendix : *Challenger*'s Captains	242
	Index	243

List of Illustrations

Challenger *Frontispiece*
Rounding Cape Harrigan. Voyage North—July 1932 *facing page* 10
Pan Ice. Voyage North—July 1932 10
Nain, Labrador 11
The Carenage, St. George's, Grenada 26
Lieut.-Commander Baker and Officer's Steward Holgate starting off for a day's surveying 27
Petty-Officer Stevenson feeding the dog teams 27
Nutak—half way to Hebron 42
Hebron—the journey's end 43
Renatus building snowhouses 58
A survey camp *between pages* 58–59
Springtime travel *between pages* 58–59
Buck Baker and Dennis Deane going out from Nain to meet *Challenger*, July 1934 *facing page* 59
Main Street, Hillsborough, Carriacou, Grenadines 74
The surveyor's topographic task in the Grenadines 75
In the floating dock—Bermuda 90
The new furnaces arrive in Bermuda 91
Christmas—1937. Alongside the new wharf at Trinidad 106
Fishermen at Port Said 107
Passing through the Suez Canal 122
Anchored off Muscat 123
Sheikh Khamis Bin Hilal approaches with his 'Army' 138
Commander Baker with Sheikh Khamis Bin Hilal and his Brothers 138
Anchored alone at the head of Hvalfjord, June 1940 139
Making Sail 154
Camouflaged—Sheerness, May 1942. Before sailing to join the Eastern Fleet 155
Rigging a survey beacon on deck 170
Laying a moored survey beacon 171
Challenger's echo sounding launch.—Winter Harbour, Vancouver Island 186
Coming alongside—Pearl Harbour 187

facing page
Heavy weather—North Pacific 202
Black-footed Albatross alongside the ship—North Pacific 203
Fijian women dance the 'Meke' 218
Children on Funafuti Atoll 219
Challenger's judo team—Ominato, Japan 234
Arriving at Portsmouth for the last time. Commander Ashton poses for the Press wearing one of *Challenger*'s many 'Trophies' 235

Maps and Diagrams

Somerville sounding gear *page* 5
The coast of Labrador.—The inshore route north taken by H.M.S. *Challenger* in 1932 12
The Submarine Sentry 15
Scheme of Triangulation 29
Survey area northwards from Nain, showing first part of sledge journey to Hebron 44
Theory of station pointer fixing 63
Approach route to Ras at Tannura 78
Triangulation mark in the Gambia River 116
Swept depth channels, Torres Strait 150
Portion of Fair Chart 'Approaches to Umm Said', as surveyed by H.M.S. *Challenger*. Drawn by Lieutenant P. J. D. Hayter, Royal Navy. 174
Portion of Admiralty Chart 3787, published 9th April, 1948, from the survey by H.M.S. *Challenger* 175
A seismic refraction experiment, showing the paths by which various sound waves travel from explosion to the hydrophones 187
Structure of Funafuti Atoll as deduced from seismic experiment 223
Baillie rod and sinkers 227
The Western Pacific, showing positions of the main ocean trenches 231

Acknowledgments

A DOZEN different Captains wrote nearly three hundred Letters of Proceedings at the old-fashioned mahogany desk in the Commanding Officer's 'cuddy' in *Challenger*. Before telling the story of the ship I had to read all these and I am indebted to the Hydrographer of the Navy for giving me access to them, and for his permission to reproduce portions of two charts.

Some of these Letters of Proceedings hint at interesting or amusing happenings and give some description of the difficulties being encountered by the Surveyors, but for the most part they are but brief factual accounts of the movements of the vessel and the month-to-month progress of the work. When I had read them and made notes I had a framework upon which to hang the tales of her Company and the stories of the ship herself.

I have, therefore, to thank a very large number of persons, many of them in the Royal Naval Surveying Service, for so willingly assisting me to spin the yarn, for I have served but a brief period in *Challenger* compared with many of my informants, who have returned for second and even third commissions in the dear old ship.

To list the name of everyone to whom my thanks are due would be a long task. I must specially mention a few who have supplied me with invaluable material: Vice-Admiral Sir Guy Wyatt, K.B.E., C.B., who lent me his manuscript of a paper on *Challenger*'s pre-war work in Labrador which appeared in the *Journal* of the Royal Geographical Society; Captain E. H. B. Baker, D.S.O., R.N., who lent me his spirited diary kept whilst on detached survey work in Labrador, and gave permission to use many of his excellent photographs taken whilst serving in *Challenger*; Commander G. P. D. Hall, D.S.C., R.N., who generously allowed me to make the fullest use of his notes made whilst serving in *Challenger* and which he had intended for a book of his own; and also Commander Alun Jones, R.N., and Commander J. M. Sharpey-Schafer, O.B.E., R.N., who both supplied

me with a number of anecdotes about the ship during their respective periods in command.

Among others who have helped me with material and given encouragement are Vice-Admiral Sir John Edgell, K.B.E., C.B., F.R.S., Captain R. M. Southern, R.N.; Captain G. D. Tancred, D.S.C., Royal Australian Navy; Captain H. Menzies, R.N., Captain C. C. Lowry, R.N., Commander C. Sabine, O.B.E., R.N., Commander R. Bill, D.S.O., R.N., Commander R. T. Tripp, R.N., Lieutenant-Commander E. E. Croome, R.N., Commander D. L. Gordon, R.N., Commander D. N. Penfold, D.S.C., R.N., Commander J. C. Grattan, D.S.C. and Bar, R.N., Lieutenant-Commander J. A. B. Thomson, R.N., Lieutenant-Commander S. J. Hales, R.N., Lieutenant-Commander G. J. B. Simeon, R.N., Lieutenant-Commander J. M. Nicholas, R.A.N., Chief Petty Officer C. Long, B.E.M., Surveying Recorder First Class, and Petty Officer J. Greenshields, B.E.M., Surveying Recorder First Class.

Also, I must thank Commander Bill Ashton, D.S.C., R.N., who throughout many years' friendship has told me countless amusing yarns, many of them about *Challenger*, in which he served as Navigating Officer and later as her last Commanding Officer.

To these must be added Mr. R. J. Crowford and Mr. C. T. Laws, formerly Royal Marines serving in *Challenger*, who are now back in their civilian employment at the Hydrographic Supplies Establishment at Taunton, and who told me much of their work and play in the old ship, during one cold snowy night when we were sheltering together in the bar of the Castle Hotel, Taunton. Mr. Crowford prepared the maps and sketches for this book.

To Dr. Tom Gaskell and Dr. John Swallow I must give very great thanks—they showed me that there is much to be found out about the bed of the ocean apart from its mere depth below the surface. They never tired of answering my layman's questions about their scientific experiments, and many a night watch I passed away in Tom's company as he described his theories of the deeps. Dr. Swallow took most of the photographs used to illustrate the World Voyage.

I have to thank Mr. G. B. Stigant, O.B.E., late Chief Civil Hydrographic Officer in the Hydrographic Department of the

Admiralty, and Mrs. C. S. Auckland, in the Secretariat of the same department, for forwarding references to me when I was at sea and far from the amenities of the Admiralty Library; and also Mr. J. A. Jerome on the staff of the Chief of Naval Information, who helped me with some of the difficulties of writing a book for publication in England whilst sailing the waters of the Pacific.

Finally, I owe a great debt to my wife who has read and corrected my work at every stage, and who rescued the manuscript of the final chapter from among the springs of an old sofa where it had been taken by my eldest son's white rat for use as nest-building material.

G. S. Ritchie

H.M.N.Z.S. Lachlan, 1956.

Foreword

'A FAMOUS NAME'

THE Naval Surveying Service, a branch of the Royal Navy, was established at the end of the eighteenth century and at first formed only a very small section within the Admiralty. The duty of this branch was to record and index the large amount of surveying data which was gathered at that time by many of England's navigators, including such men as Captain Cook of the Royal Navy and Dalrymple of the East India Company, who was chosen to be the first Hydrographer of the Navy. Very soon, however, it was seen that special ships would be needed for surveying duties and that officers should be specially selected for this valuable work which requires devotion and endurance to an exceptional degree. So the Surveying Service was formed and for many years about eight ships have been maintained by the Navy for surveying work, and about 60 or 70 naval officers who have specialised in hydrographic surveying have gone to sea in these ships with naval crews to make the Admiralty charts in many and varied parts of the world.

Surveying ships carry no guns or offensive weapons in times of peace and they can be distinguished from other naval vessels by their white hulls, with yellow funnels and upperworks. Nothing pleases a naval surveyor more than to be greeted with a word of praise for his ship: 'I saw your vessel working in the bay last week. She looked just like a beautiful yacht.' He likes to hear the reference to the work as much as he does the comparison of his ship with a yacht, for he prides himself on being a hard worker. Every advantage must be taken of spells of suitable weather and very long hours are worked by all onboard, for when the gales come the ship may lie weatherbound in some remote anchorage, the Captain anxiously peering from his cabin windows at the wind and the rain and turning to look at his barograph for any sign that moderating weather will allow him to resume work on the survey; while the junior surveying officers are often content enough to hear the wind howling or to see the fog closing in to give them some respite from the apparently endless days of sounding in boats.

Modern surveying ships have borne the names of many of the great surveyors of the past, such as Cook and Dalrymple, Fitzroy and Flinders.

The ship about which this book is written also bore a famous name. She was called after H.M.S. *Challenger*, built at Woolwich for the Royal Navy in 1858, and more famous in the fields of science and exploration than in the line of battle. This earlier vessel was a screw corvette of 1462 tons displacement with a two-cylinder engine, using a twin-bladed propeller which could be disconnected and hoisted clear of the water when she was under sail.

In 1861 she left for service on the east coast of North America and the West Indies, taking part in operations against Mexico in 1862. Her next commission was on the Australian Station, where little unusual occurred, except that she visited Fiji on a punitive expedition to avenge the death of a missionary and his dependants who had been murdered by the Fijians.

It was in 1872 that her career took a dramatic turn when she was selected as a surveying vessel to be employed on a scientific cruise round the world.

For some years the Royal Society had been sending scientists to sea in naval surveying ships. These were the first real efforts made to find out something of the physical make-up of the ocean and of the life within it beyond the immediate vicinity of the coast. Professors W. B. Carpenter and Wyville Thomson had been the prime instigators of these cruises which had been conducted off the north-west coast of Scotland and in the Mediterranean. But knowledge of the depths of the oceans was still extremely vague; there was a widespread belief that there was an azoic zone below a thousand fathoms or so where no life existed, despite evidence to the contrary provided by starfish which had become entangled in deep sounding lines; many considered that the ocean's floor would be flat and featureless; of what the ocean bed was composed no one knew; there had been considerable discussion, based on slender data, whether the temperature of the oceans decreased steadily with depth or whether there were zones of warmer water alternating with cold. 'The vast ocean lay scientifically unexplored', said the Circumnavigation Committee of the Royal Society when they approached the Admiralty with a proposal that a world voyage should be made.

Dr. Carpenter had already been in communication with their Lordships and had done much groundwork so that things moved swiftly, and in a very short time the Hydrographer of the Navy, Admiral G. H. Richards, was vigorously under way with plans. Captain G. S. Nares, a surveying officer of great experience, was chosen to command the *Challenger*. As the Royal Society had nominated Dr. Wyville Thomson to be the scientific leader of the expedition these two worked in harmony from the start, for they had sailed together in similar appointments on the most recent oceanographic cruise to the Mediterranean in the surveying vessel *Shearwater*.

The sparse nautical figure of Captain Nares, with his neatly pointed beard and high bald forehead, and that of his more portly but active scientific companion were familiar enough in and around the dockyard at Sheerness during the summer of 1872, and the ship steadily took shape as the first British vessel ever to be fitted out exclusively for oceanography. Her spars were reduced and all her guns except two were landed. This made room for laboratories and workrooms, stores for thousands of fathoms of dredging and sounding ropes, storage spaces for the almost countless specimens which it was planned to collect, for the spirits of wine which would be needed to preserve them, and for the trawls, nets and dredges with which they would be taken.

By 6th December all was ready and the President and Council of the Royal Society and the members of the Circumnavigation Committee were invited to inspect the *Challenger* at Sheerness. 'A saloon carriage will be ordered to be in readiness to convey them to that port by the 10.30 a.m. train from Victoria Station', wrote the Secretary to the Admiralty.

A few days later the ship sailed for Portsmouth, encountering a great gale off the Kentish coast; in fact the scientists, who had not yet found their sea legs, were landed by request in the Downs and travelled by road to Portsmouth.

Captain Nares,* a 'devilish good fellow', as Sub-Lieutenant Swire described him in the jargon of the day, was assisted by a fine team of deck officers and engineers, with Navigating Lieutenant Tizard, one of the cleverest surveyors in the service, in charge of the surveying work and of the fixing of the positions of the many sounding and oceanographic stations which were to be occupied by the ship. The scientists under Wyville Thomson numbered three naturalists, Murray, Moseley and Willemoes von Suhm; Wild, who was secretary to Thomson, and was also a most capable artist, and Buchanan the chemist. Dr. Suhm died at sea of erysipelas during the latter part of the voyage.

The objects of the expedition were clearly set out in the instructions issued to Captain Nares and Dr. Thomson. These were fourfold:

1. To investigate the physical conditions of the deep sea in the great ocean basins (as far as the neighbourhood of the great southern ice-barrier), in regard to depth, temperature, circulation, specific gravity and penetration of light.
2. To determine the chemical composition of the sea water at various depths from the surface to the bottom, the organic matter in solution and the particles in suspension.
3. To ascertain the physical and chemical character of deep-sea deposits and the sources of these deposits.
4. To investigate the distribution of organic life at different depths and on the deep-sea floor.

At first the weather was furiously against such work and on that first Christmas Day at sea there were many of the scientists, and sailors too, who wished, as the ship wallowed and creaked in the heavy seas, that they were enjoying their Christmas dinner in the familiar surroundings of the homes they would not see again for nearly four years. Nor were the first attempts at dredging successful even when the weather did moderate, for all were unaccustomed to this novel and difficult technique for hauling quantities of life from regions completely unknown to Man. Three times did the dredging rope part with loss of gear before the ship reached Lisbon, her first port of call.

---

* On 18th January, 1957, Vice-Admiral J. D. Nares died in harness as Director of the International Hydrographic Bureau at Monaco. He was born in 1877, about two years after Captain Nares' return from the *Challenger* voyage, and, like his father, spent his life in the Naval Hydrographic Service.

Here the King of Portugal paid a visit to the ship, being the first of many personalities who were to interest themselves in the fascinating work of the *Challenger*.

After sailing from Lisbon the expedition's luck changed and soon the sounding, dredging, trawling and the taking of water samples and temperatures became routine work. No fewer than 362 of these stations were made during the course of the world voyage; at each of such stations sail was shortened, for it was necessary to navigate under steam to keep the vessel up to the sounding line so that a true vertical distance to the sea-bed should be measured.

To avoid sudden jerks on the one-inch Italian hemp line which was used for sounding this was rove from the deck engine through a leading block slung from the foreyard before descending to the depths. The leading block was secured to the foreyard by a so-called accumulator composed of twenty stout india-rubber ropes, each being passed through individual holes in two large wooden discs to keep them separated. These accumulators were capable of considerable stretch and took up the violent motions of the heaving and pitching vessel without transmitting them to the sounding line.

In the early days of the cruise there would be a great concourse on deck each time the dredge or trawl broke surface to watch the naturalists attacking the formidable task of sorting hundreds of specimens of marine life which scattered the deck, or lay concealed in the grey or reddish ooze from the seafloor—fish of strange colours and shapes, deep-sea corals, sponges, starfish, deep-sea worms and sea urchins and many more, some large and obvious, others small and obscure, to be searched for with sieve and microscope. But soon this work became boring in the extreme to those handling the ship or working the winches during the day-long task of bringing one haul from the depths. Only Wyville Thomson and one or two of his assistants would be there at nightfall to see their treasures tippled from the net, or, as on one or two miserable and notorious occasions, to see the trawl ropes part just as a heavy catch was raised clear of the water, allowing a mass of life to sink back into the ocean before their eyes and containing perhaps priceless gems never to be captured again.

Whether or not something new would be taken in the next haul became a matter for betting with gin and bitters as stakes, and for many of the wardroom this soon became their only interest in this tedious business.

And so the ship crossed and re-crossed the Atlantic, the southern part of the Indian Ocean and the Pacific. She called at the British ports of Gibraltar, Bermuda, Halifax, Cape Town, Melbourne, Sydney, Wellington, Hong-Kong and Port Stanley to re-provision and carry out repairs. She visited Madeira, Teneriffe, St. Thomas, Cape Verde, Bahia, Yokohama, Valparaiso, Montevideo and Vigo, and at each place expeditions were made into the hinterland by the scientists and the officers, their observational powers sharpened by the knowledge of the importance of the voyage upon which they were embarked; they recorded details of the lives of the people; the activities, or lack of such, by governments, and the flora and fauna of the countryside. Many little-inhabited or uninhabited islands were visited, where specimens were obtained of every animal, plant or even stone to be found upon them. These included St. Paul's Rocks, a small group less than one hundred feet high situated upon the Equator far out in the Atlantic, and past which the river of the Equatorial Current runs so steadily and so swiftly that the ship was able to secure by a hawser to one of the rocks at the western side of the group and lie there for two days and nights, whilst the scientists examined the few inhabitants of this barren spot; these consisted of two species of noddy, a booby, a spider and a crab. Meanwhile the men fished for abundant cavalli from a boat made fast to the hawser securing the ship to the rocks.

The visit to the island of Fernando Noronha, lying between St. Paul's Rocks and Bahia, was not such a success, for although the vegetation and the birds were both of considerable interest, the island was a Brazilian prison and the Governor, although courteous, would not give permission for collecting.

Tristan da Cunha was reached on the way to the Cape and here some high-priced provisions were bought, and two Germans, who had been living a Robinson Crusoe existence on nearby Inaccessible Island for over 18 months, were rescued from a life among myriads of penguins and a herd of pigs rendered inedible by their diet of penguin flesh.

Prince Edward Island, Crozet and Kerguelen in the far southern Indian Ocean, and known only to a few inarticulate whaling skippers, were explored, every detail of their natural history being recorded. From Kerguelen the ship sailed southward and crossed the Antarctic Circle in February 1874, the first steam vessel to do so, and here spent some weeks among storms and icebergs and low visibility. Many anxious days were spent in endeavouring to trawl among the forest of icebergs and more anxious nights endeavouring to keep clear of these rugged rocks of ice; on one occasion the ship collided with a berg at night, losing her jib boom but suffering no more severe damage. 'All hands on deck!' was a frequent cry on those cold nights as disaster loomed up ahead through the falling snow.

The expedition visited many islands in the south-west Pacific, recording the way of life and the material culture of the native population, both of which were changing rapidly at that time as the full impact of the western world was being felt with the ever-growing influence of the missionary and the trader. The anthropological records made by scientists and officers of the *Challenger* in these areas may one day prove to be among the most important they made, for they photographed, sketched and collected material among the natives of Tonga, Fiji, New Hebrides, Cape York, New Guinea and the Admiralty Islands. Moseley in particular noticed how the old life was fading away and realised how vital it was to record every vanishing facet.

The efficient colonial rule of the Dutch was seen in the Moluccas, the crumbling rule of the Spaniards was observed in the Philippines. Members of the expedition were granted an interview with the Emperor of Japan; King Kalakano of Hawaii was entertained, he at that time steering a wavering course between British and American supporters; Queen Pomare of Tahiti, much under the thumb of the French, attended a ball onboard the ship. And here at Papeete the Challengers had a wonderful time ashore where then, as today, the welcome for the seafarer was overwhelming. The Tahitians are among the friendliest and most lovable people on this earth.

Early in 1876 *Challenger* passed through the Straits of Magellan, seeing some of the Fuegian Indians, the most miserable and dejected people they had encountered on the whole voyage.

The old ship anchored in Spithead on 24th May, 1876, having been away 3½ years and having sailed 68,500 miles. Out of 243 men who had set sail, 61 had deserted the ship on the long voyage, an interesting light on the discipline of those days. But much was also the same at sea then as it is today; a seaman, Wilton, was lost overboard from the chains in heavy weather in Cook Strait. 'He was a quiet, well behaved man and always did his duty well', wrote Sub-Lieutenant Swire in his journal. 'Such men are scarce in the Navy nowadays.' This remark might be heard in a wardroom today.

There is little evidence of any serious friction between the naval officers and the scientists on this long and arduous voyage, which says a great deal for the skill with which the Hydrographer of the Navy and the Royal Society chose these men. There were of course many minor incidents, such as the calling on deck of the men at night to search for a broken spar, for the officer on watch had heard an ominous crack. In fact this had been caused by Moseley in his cabin firing a paper pellet from his airgun at a large cockroach which had for long escaped him. On another day Commander McLean, the executive officer, stubbed his toe on a giant spider as he put his feet into his seaboots. The naturalists had brought this animal onboard for study but it had gone into hiding.

One of the tasks set the *Challenger* scientists was to investigate 'bathybius', a supposed primordial stuff of life believed to exist in the depths. This fabulous white matter had been found in samples taken from the sea-bed but proved eventually to be nothing more than a white precipitate resulting from the addition of preserving spirits of lime to sea-water. However, before this had been discovered the philosophers were in a great state of excitement one day when a deposit of 'bathybius' was found among sample bottles in the laboratory. While they were gathered excitedly around this a marine came in to ask if anyone had seen his pipeclay which he thought he had mislaid somewhere in the laboratory.

The ship lived on, dismasted and unrigged, as a coal hulk until 1921. Captain Swire, the last survivor of the expedition, died in

1936. But the ship and her company will never be forgotten in the world of science.

An expedition of this nature would not have gained lasting fame had not the results been carefully prepared and published. Sir Wyville Thomson set up an office in Edinburgh for this purpose, and here, under his direction, Murray commenced to write the famous Challenger Reports. In 1882 Wyville Thomson died and Sir John Murray eventually published the fifty volumes, each carefully edited and many beautifully illustrated, these forming the very basis for all studies concerned with the oceans from the time of their publication until the present day. To these must be added several popular accounts which were written by members of the expedition, each stressing their particular interests on the voyage. So today, whether one is studying oceanography, geology, geophysics, ornithology, zoology, botany or anthropology one cannot read far without stumbling across a reference to the *Challenger* Expedition of 1872–76. Such references run into thousands and provide the most suitable memorial to the famous old ship and the enquiring and forceful men who sailed in her.

Whether the surveying ship *Challenger*, which has so recently been towed away to the breaker's yard, has, in her very different way, upheld the famous name, the reader will be able to judge for himself.

I

The New Ship

CHALLENGER was originally planned as a suitable vessel for searching for and surveying new fishing grounds in northern waters, and as such she was to be paid for by the Ministry of Agriculture and Fisheries, but was to be administered and run by the Hydrographer of the Navy. The ship's officers and crew were to be men of the Royal Navy, the Captain and the deck officers being surveyors. A small scientific team was to be carried to study the environmental conditions of the fish; a trawl was to be part of the ship's equipment and a fishing skipper and four trawlermen were to be carried to shoot it on the fishing grounds to see what type of catches could be expected by commercial fishermen. As the ship was to be built in the Royal Dockyard at Chatham and was to sail under the White Ensign, the Ministry of Agriculture and Fisheries suggested that Rear-Admiral H. P. Douglas, then Hydrographer of the Navy, might like to name her. His mind at once turned to the earlier surveying vessel which had been so successful in carrying out scientific investigations in the oceans and he had no difficulty in selecting an honoured name. So *Challenger* it was—the sixth ship of this name to serve in the Royal Navy and the second to serve in the Surveying Service.

Challenger was to be a single-screw steam ship of about 1200 tons, just over 200 feet long; she was to be broad in the beam with a high forecastle; her stern was to have an overhanging counter. She was of an unusual design for a naval vessel, planned to stay at sea for a month or more in the waters around Spitzbergen, Iceland and Greenland where heavy seas are commonplace and ice forms on the decks and rigging. Many took a hand in the planning of the ship and by no means all of these were in agreement with the design. Minutes written by those concerned in Admiralty at the time include one which reads: 'God help all who have to sail in this fantastic ship.'

She was built in a drydock in Chatham Dockyard and was launched on 1st June, 1931, by Miss Addison, daughter of Dr. Addison, the Minister of Agriculture and Fisheries, in the presence of the Hydrographer of the Navy.

She was not allowed to take the waters gracefully in the normal manner, but unromantically floated on the slowly rising waters of a dry dock, and as the bottle of champagne was broken on her bows, towed away by an undignified tug. Later she entered dry dock again for final fitting out.

Lieutenant-Commander E. H. B. Baker was appointed to *Challenger* about the middle of 1931 to 'stand-by', as it is called. This officer assists the dockyard officers with the siting of many of the minor fittings, boat hoisting arrangements, ship's company's amenities and numerous other items which can be much improved with the advice of a sea-going officer. A boatswain was appointed to assist Baker, the Engineer Officer having been appointed earlier.

These three officers were standing on the deck as the water was let into the dry dock to float the completed ship. The water rose towards the ship's water-line and then slowly above it. The wooden shores supporting the ship on the starboard side floated clear but it was obvious to the officers on the deck that the shores on the port side were still under great pressure; then, suddenly, there was a rending and crashing sound as the port side shores splintered and broke as the ship heeled quickly over to port. The heavy work boxes belonging to the dockyard workmen which had been stacked on deck slid down with a terrifying clatter and the small group of officers found themselves alone on a deck sloping at about 12 degrees.

There had been no one of importance on the dockside to see the second launching of the *Challenger*, but very soon the Admiral Superintendent of the Dockyard and many other 'brass hats' and senior dockyard officers were mustering around the dockside, to see the distressing sight of a brand new vessel lying afloat in the dock with a heavy list to port. She had compelled men of importance to witness her final launching.

Some miscalculation or some departure in construction from the plans had caused this instability, and many tons of ballast had now to be placed in the bottom of the ship to make her stable. Those who had doubted her suitability for her work felt that they had been justified, and others said that a mishap at the launching boded ill for her future. In fact, when she had been properly ballasted she proved to be one of the most seaworthy vessels ever built; although she was lively she was extremely 'dry' —that is, she rode the seas and shipped very little water onboard. All who have served in *Challenger* speak highly of her fine qualities in this respect. It was an exciting experience to stand on the bridge looking aft when the ship was running before a really high following sea; great waves would come towering towards her tiny quarterdeck and at the last moment, when you could be sure that it was too late and that she was to be badly pooped, her stern would rise steeply upwards and a great wave would pass safely below.

Challenger was completed in the autumn of 1931: her Captain had been chosen and the scientists had been selected; but 1931 was the year of the great financial slump, the economy drive was on, and soon the Ministry of Agriculture and Fisheries realised that they would be unable to afford this ship. So *Challenger* lay, complete and ready for sea, in the basin at Chatham, her future uncertain at the very commencement of her career.

Lieutenant-Commander Baker, a forthright officer, and known affectionately in the Surveying Service as 'Buck', took command of the ship with only a handful of men to keep her alive. Buck knew, as all good seamen do, that if a ship is once reduced to a care and maintenance state she will take a very long time to get back to sea again. A ship lives only when men are looking after her, and when her gear and equipment are receiving daily attention. Buck resisted, as only he can, all the efforts of officialdom to reduce *Challenger* to a care and maintenance state. He, his Engineer Officer, his Boatswain and his few seamen and stokers got down to the work together, wielding brooms and paint brushes, deck scrubbers and holystones. The ship remained alive but her future was still undecided.

This was the state of affairs a few days before Christmas, 1931. Every man who could be spared from *Challenger*'s skeleton crew had gone on Christmas leave when the Captain was called to the telephone. The Operations Officer on the staff of the Commander-in-Chief, The Nore, asked him if he could be ready to sail for Portsmouth in the morning as the ship was required by the Admiralty to go there at once. The ship's boilers were in a state of preservation, the fuel tanks were empty and the crew on leave: tomorrow was impossible, but by recalling the crew from their Christmas festivities and by every man's doing his utmost, the ship sailed in three days' time, the skeleton crew being augmented by a few ratings from Chatham Barracks to form a steaming party.

The Captain had been told that he was urgently required at Portsmouth and he thought he had done well to get there so quickly. In those days a Commanding Officer put on his frock coat before waiting on an Admiral, and as he stepped ashore at Portsmouth so attired he was pleased with himself and anxious to know what urgent work lay in store for his new vessel. He was shown in to the Admiral who had been informed that the C.O. of *Challenger* was there to see him. 'Good morning, Baker,' he greeted him. 'What is *Challenger*—a new fleet repair ship?' Buck wondered where the urgency lay.

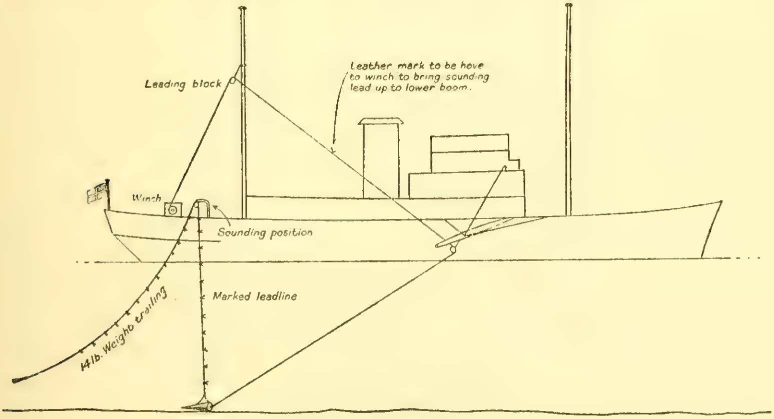
Naval ratings are all attached to one of three manning ports—Chatham, Portsmouth and Devonport—and in peace time at least it is the custom to man a ship with a crew all drawn from one of these three depots, as they are called. Although the ship had been built at Chatham it transpired that her arrival at Portsmouth had been ordered so that she might commission with a Portsmouth crew of about one hundred men, which she did on 2nd January, 1932. Except for the war years, when crews were mixed, she has had a 'Pompey' (naval slang for Portsmouth) crew ever since.

It had been decided to take her over as a full-time naval surveying ship, and, as this service is limited in its number of ships, often an old and well-loved ship goes to make room for the new. H.M.S. *Iroquois* was due at Portsmouth in a few days' time from the Red Sea after many years surveying in the East, and orders had been given that all her stores and surveying equipment should be transferred to *Challenger* on her arrival. *Iroquois*'s surveying days were over.

Surveying ships in peace time go to sea for their working period during what is called the 'season', which lasts for eight or nine months while the weather is at its best. The remaining three or four months of the year is known as the 'lie-up', when the ships are refitted and the surveying officers draw the fair charts from the data collected during the past season. In Home waters, the season usually commences about 1st April and the removal of funnel covers from surveying ships is as much a sign that spring has arrived in a dockyard as the note of the first cuckoo in the countryside.

So *Challenger* was to start her first season in April and in January Captain A. L. Jackson took over command from Baker, who once again became the First Lieutenant and went ahead with his preparations for the coming season. Like all good First Lieutenants he kept his eye open and acquired little things for the ship which might otherwise have benefited no one. The old battleship *Marlborough* was being stripped at Portsmouth prior to being broken up, so it was only sensible to become friendly with the nightwatchman on board her, and soon the wardroom of *Challenger* was embellished to the extent of a fine mahogany table and a fitted sideboard. But perhaps the acquisitions of the *Challenger* did not go quite unnoticed by authority. 'Good morning, Number One,' said the Inspector of Dockyard Police. 'That fine spar there is for the Royal Yacht. I thought I had better tell you, as I have heard *Challenger* requires a lower boom.'

The most vital information on an Admiralty chart is the depth of water; thus the taking of soundings is the most important part


Leading block
Leather mark to be hove to winch to bring sounding lead up to lower boom.
Winch
Sounding position
Marked leadline
14lb. Weight trailing

Somerville sounding gear

of the hydrographic surveyor's work. The traditional method of sounding is by leadline, that is lowering a weight to the sea-bed on the end of a line marked in fathoms and feet. This would be easy enough if the ship could be stopped for every sounding, but as this is not practicable, the lead must be heaved far ahead so that it reaches the sea-bed at the moment the leadsman passes over it. An ingenious mechanical apparatus for accomplishing this had been devised many years previously by Admiral Somerville, a well-known surveyor, and this gear was fitted in *Challenger* as standard equipment. By means of a steam winch operated aft the lead was hauled forward after each sounding, the leadsman being stationed near the winch on the quarterdeck. A trailing counterweight kept the leadline nicely taut.

In 1931 a shallow water echo sounding set was being introduced in surveying ships. This machine emits a sound toward the sea-bed and measures the time taken for the echo to return to the ship. These early machines employed a formidable hammer in the bottom of the ship which banged out a signal at frequent and regular intervals; the operator on the bridge then ran a drum marked with the various depths backwards and forwards until he received the loudest returning signal in his earphones, when he read off and reported the sounding showing on the dial.

In *Challenger*, in addition to shallow water sets, there was fitted a new deep echo sounding machine designed to take soundings in the deeper ocean. The first thing to be done before the season started was to carry out trials on the echo sounding sets and to do this the ship would have to proceed to seaward of the continental shelf to find deep enough water for trying out the deep sounder.

The continents are surrounded by a comparatively shallow and gently sloping shelf formed over millions of years by deposits carried seawards by water flowing off the land. At a depth of about 100 fathoms the edge of this shelf falls rapidly away to depths of 2000 fathoms or more, and the true oceans have been reached. The whole of the English Channel lies within the continental shelf, and to reach the edge of the shelf the ship had to steam south-westward from Plymouth for a distance of 200 miles or more.

The deep set recorded the depths on iodised paper, and clear recordings were obtained to a depth of 1200 fathoms. These soundings were checked by the 'Lucas' wire sounding machine, which employs piano wire on which a sounding lead can be lowered to the greatest depths and can be recovered by the steam engine which forms a part of the machine.

The first half of the surveying season was then spent off the green, rock-bound coast of Aberdeenshire, charting the Buchan Deep, and later in the turbulent waters of the Fair Isle Channel assisting oceanographers to measure the flow of water from the Atlantic into the North Sea. It was an uneventful period, but it served as a 'shake-down' cruise, as they say in the Navy, when officers and men appointed to a new ship become familiar with her and her equipment; for every ship is an individual to be studied and humoured by her company before she will give of her best.

In June *Challenger* was ordered to the coast of Labrador. Labrador was administered by the Colonial Office and thus the charting of her coastline was the responsibility of the Hydrographer. It was generally desired at this time to open up a coastal route among the labyrinth of uncharted isles and rocks which endangered the navigation of mail steamers and other vessels trading in the north, and which thus formed a barrier against the development of this rugged country.

At Portsmouth, Commander A. G. N. Wyatt took over the command of *Challenger* from Captain Jackson on Monday, 13th June, 1932, and preparations went forward in earnest for the forthcoming survey in Labrador; on Friday, 24th June, the ship sailed for St. Johns, Newfoundland.

The surface of the ocean is constantly in motion, with many great current rivers flowing along their established courses, such as the Gulf Stream in the Atlantic, the Kuro Shio in the North Pacific and the Humboldt Current in the South Pacific which carried the *Kon-Tiki* voyagers on their way. The British seaman Dampier was the first man to carry out a comprehensive study of these ocean currents and they are still being mapped today. Their speeds and directions can be shown on ocean charts, but beneath the surface lies a complex system of currents, always moving, with waters of different temperatures and salinities; a system to which the whole life cycle of the deep sea fauna is completely connected, but of which man as yet knows very little.

As they probed into the depths of the ocean, scientists had expected the temperature to decrease and the salinity and the pressure to increase; but it is found, in fact, that it is usually only the pressure which increases at a steady rate with depth. The different water masses moving beneath the surface cause irregular fluctuations in both the temperature and the salinity, and such fluctuations in turn affect the speed of sound in the water—and hence soundings obtained with an echo sounder.

Working on the returns of temperature and salinity at depth recorded by many of the world's oceanographic expeditions, from the *Challenger* of 1875 onwards, Dr. D. J. Matthews of the Hydrographic Department had divided the world up into a number of areas, in each of which he considered the water conditions to be similar enough for him to establish tables of corrections to be applied to echo soundings to give the true depth; but so few and far between were the available data that Matthews was anxious to revise his tables, and by 1932 he was actively collecting records for this work, which he completed in 1938. In the North Atlantic over the next three or four years *Challenger* was to be able to occupy a considerable number of stations to make oceanographic observations of this nature as she voyaged between Portsmouth and her survey grounds in the West Indies and in Labrador.

An instrument known as a 'reversing water-bottle' is used to obtain this temperature and salinity data. A number of such bottles are attached at set distances apart on a wire running from a winch on the forecastle. The reversing water-bottle is an open-ended cylinder with thermometers attached to the outside. When lowered into the water these bottles are set like mousetraps, to be sprung later by a small weight or 'messenger' which is sent down the wire when the bottles have been lowered to the correct depth. When thus sprung, the bottle turns upside down and closes, trapping a water sample, which may later be bottled for salinity analysis; while the temperature at the time of the reversal of the bottle may be read from the special thermometers which are designed to record the temperature at the time of the arrival of the messenger.

Such observations are somewhat laborious, and in order that they may not hold up other survey work, they must go forward in any weather, day or night. To keep the ship head to wind and the wire vertical the officer in charge needs to be fully alert, and it may take up to five hours to complete all the observations at a station in deep water of 2500 fathoms or so. It is recorded that on 24th November, 1932, a standard series of temperature and salinity observations was obtained while a strong west-nor'-west wind was blowing, causing the ship to roll up to 25 degrees, but that the ship lay very well with main try-sail set and her engines turning slow ahead, with an occasional kick of half ahead to straighten her when she tended to fall off the wind. *Challenger* carried a fore-sail and a try-sail, probably the last naval vessel to carry sail.

Perhaps it was after such an occasion that a tot of gin found its way into one of the samples before they were despatched for analysis in England, but the chemist was up to his work, for he sent a note back to say that further sampling at this particular station should augment the wardroom wine stocks.

And so *Challenger* occupied 'bottling stations' for many long hours during her passages in the Atlantic during the next few years.

Modifications had been made to the *Challenger* deep echo sounding set, and on passage across the Atlantic soundings were obtained with ease at depths down to 2580 fathoms. Even today there are very few vessels fitted with sounding sets recording more than 600 fathoms; so it is upon research vessels, survey vessels and telegraph cable ships that hydrographers rely to obtain data on the topography of the ocean bed, the average depth of which throughout the world is about 2700 fathoms. When obtained, much of this deep sea sounding information is passed by member states to the International Hydrographic Bureau at Monaco, which maintains a world series of bathymetric charts depicting the complex topography of the floor of the world's oceans. It is when looking at the few lines of soundings across the vast areas comprising the oceans that one realises how much there is to be learnt about such a large part of the earth's surface.

II

Labrador

On Tuesday, 5th July, 1932, *Challenger* arrived at St. John's, Newfoundland, and the Captain made the usual calls on the Governor and the Prime Minister. Arrangements were made for Captain Clarke, Master of one of the Newfoundland Government steamers, and well acquainted with the northern Labrador coast, to be embarked to act as pilot on the voyage 'down north', as they say in these parts. The coast of Labrador is fringed with countless islands and islets and the sea-bed is extremely rugged with pinnacle rocks rising to within a few feet of the surface.

No better captain could have been chosen for this survey work in Labrador than Commander Wyatt. He was a real seaman in the very finest sense, navigation being second nature to him. In his leisure moments he might be found sitting on the deck outside his cabin sewing canvas or splicing wire rope. Officers and men who sailed with Wyatt always had supreme confidence in his ability as a seaman and, although a strict disciplinarian, he was well loved by his ship's companies in *Challenger*. His speech was that of a good old-fashioned seaman; one day the Boatswain was baffled by the Captain ordering him to remove a mouse from the forestay, a 'mouse' being a piece of spun-yarn wound round a wire or rope to form a thickening.

The Labrador coast is frozen in from December until the spring, when the ice begins to break up. The ice disappears first from the inshore areas, leaving icebergs here and there along the coast, many of them grounded in the shallower water. The melting bergs also 'calve' small pieces known as growlers, which are very low in the water and are a real danger to a ship navigating at night. For another six weeks or so the pack ice prevents navigation in the waters offshore.

For a ship to pass up the Labrador coast in late summer there are two alternative routes, the open sea route or the inshore

Above: ROUNDING CAPE HARRIGAN. VOYAGE NORTH—JULY 1932

Below: PAN ICE. VOYAGE NORTH—JULY 1932

NAIN,
LABRADOR

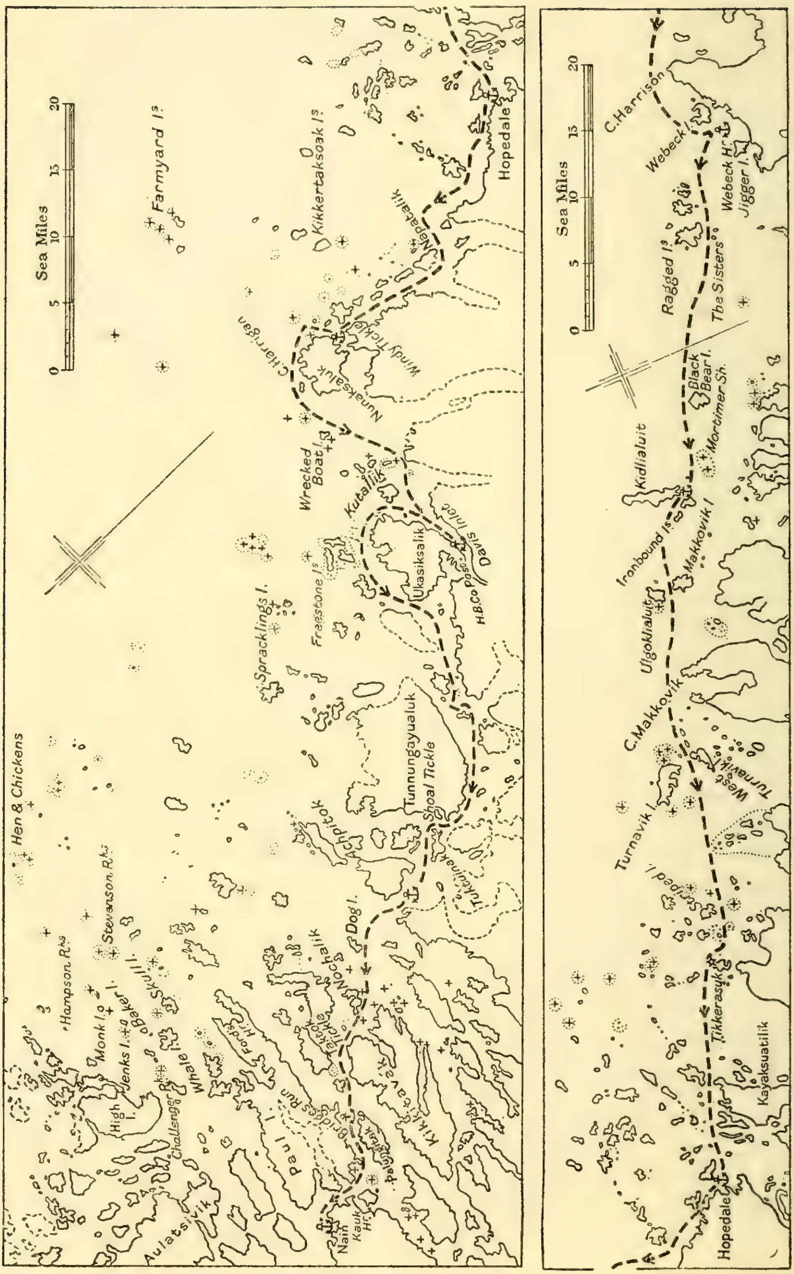
route threading between the numerous islands. The inshore route is open long before the outer route, but the inshore route was only very sketchily charted in 1932, the charts being so much in error along some parts of the coast as to be unrecognisable. *Challenger*'s instructions for her work in Labrador were to survey a route inside the islands from Indian Harbour in the south to Cape Chidley in the north, touching at each port of call, and with passages to seaward at selected intervals.

But first *Challenger* must navigate northwards along this unsurveyed coast route to reach Nain, where it had been decided to commence surveying operations. The pack ice to seaward denied the use of that route until later in the season and the work must be started at the earliest opportunity.

On Thursday, 7th July, the ship, loaded with stores and fresh provisions, and with the mails for northern Labrador, sailed for Hopedale. By nightfall the following day the ship was off Belle Isle, icebergs and growlers having been sighted during the day, which had been fine and clear, with a cloudless sky. Sailing northwards off the coast an increasing number of bergs were seen, between 25 and 50 being in view at any one time. Captain Clarke, the pilot, said that this number was usual along this part of the coast at this time of year. He had been navigating these waters as a fisherman, as a master of sealers and ice breakers and, finally, of the Newfoundland Government steamers, for over 40 years and was now 60 years of age, although he looked far younger. He spoke with the Irish brogue common to Newfoundlanders, although he was of English stock and had never been to Ireland. At times his brogue was so broad that he was difficult to follow.

Bergs were by now becoming so numerous that navigation after dark was hazardous and the ship anchored for the night of Saturday, 9th July, in Webeck Harbour, passing into the anchorage between two icebergs grounded in the entrance. Inside were two fishing schooners, frequently met with along this coast during the summer when they fished for cod, which was salted and sent to the European market.

At dawn the ship weighed and stood over to the south side of Ragged Islands, passing between them and a small double island, thence past Black Bear Island and north-eastward of Mortimer


Sea Miles
0
5
10
15
20
Farmyard Is.
Kikkertaksoak Is.
Hopedale
Nepatalik
Windy Tickle
C. Harrigan
Nunaksaluk
Wrecked Boat I.
Kutallik
Davis Inlet
H.B.Co Post
Ukasiksalik
Freestone Is.
Spracklings I.
Tunnungayualuk
Shoal Tickle
Tukkuinak
Achpitok
Hen & Chickens
Stevenson Rks.
Hampson Rks.
Monk I.
Jenks I.
Baker I.
Skull I.
Whale I.
High I.
Challenger Rk.
Aulatsivik
Dog I.
Nochalik
Tickle
Hares Fords
Paul I.
Bridges Run
Kikkertavak
Nain
Kauk Ht.
Sea Miles
0
5
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15
20
C. Harrison
Webeck I.
Webeck Hr.
Jigger I.
Ragged Is.
The Sisters
Black Bear I.
Mortimer Sh.
Kidlialuit
Ironbound Is.
Makkovik I.
Ulgoklialuit
C. Makkovik
West Turnavik
Turnavik I.
Striped I.
Tikkerasuk
Kayaksuatilik
Hopedale

The Coast of Labrador.—The inshore route north taken by H.M.S. *Challenger* in 1932

Shoal, when the wind shifted to the north-east and fog came into the land. This being long before the days of radar the ship had to look for an anchorage and just found one in a bight at the south end of Kidlialuit. By noon the fog had lifted again, and weighing anchor the ship passed between the Iron Bound Islands and then across between Mokkovik Island and Ulgoklialuit Island. She then stood over to Cape Mokkovik and between the Turnaviks, south of Striped Island and round Tikkerasuk Light and across to Kayaksuatilik, where the passage between the islands and rocks is exceedingly narrow though quite deep. The existing chart was almost unrecognisable, but from here across to Hopedale was nearly a straight run with pack ice visible to seaward. By 7 p.m. the ship was at anchor in Hopedale and the Captain landed to call on the local missionary belonging to the Grenfell Mission.

At noon on Monday the ship proceeded again northwards for Nain. Close pack ice between Kikkertaksoak Islands and the coast islands prevented the route being taken to Cape Harrigan, so passage was made through the inner sounds and Windy Tickle. Loose pans of ice, some of them very solid, were in all the bays and tickles and the ship was continually under helm to avoid them. 'Tickle' is the name given in these parts to a narrow passage between land, and the scenery coming through them was very beautiful; high hills streaked with snow and little copses of spruce at the foot of the valleys, bright sunshine with cumulus clouds, and deep blue water flecked with white icepans made an exciting picture.

On arrival at Cape Harrigan loose pack ice was found from about a mile offshore to the Farmyard Islands but only drift ice inshore, so the Captain hoped to round the cape, but fog came down and the ship had to turn back to find anchorage behind Nunaksaluk Island.

It was not until 4 o'clock in the afternoon on the following day that the fog lifted sufficiently for the ship to get under way, but at once pack ice was seen almost in to the coast, with a lead of blue water about four miles out. There was a narrow lead between the pack and Cape Harrigan, through which the ship managed to pass, only about 100 yards off the rocks but with a depth of 16 fathoms of water. After passing the cape, however, the course across to Wrecked Boat Island was entirely blocked and the ship had to push her way through loose pack, butting the smaller pans end on, rising a little, and then breaking through with her weight. After rounding the south-west end of Wrecked Boat Island the pack was heavier and the Captain decided to stand inshore to pass inside Kutallik Island, the ship finally coming to anchor for the night in Davis Inlet.

On Wednesday morning the ship was under way by 4.30 and passed north-eastward of Ukasiksalik Island, but the ice-pack extended inside Freestone Islands and it was doubtful whether it was best to try and go through it or to take the inner channels. The inner route was selected as Captain Clarke thought it likely that the ice would become worse towards Spracklings Island. The lead in the ice divided into two between Tunnungayualuk and the mainland, and choosing one of these leads the ship soon passed the wrong side of an island and had a rock awash ahead and had to bring up. The two motor sounding launches were lowered and with lead and line tried to find a passage but with no result. So the ship turned back and tried the other lead, with the boats ahead of her running submarine sentries, a simple device made of two boards about two feet long and six inches wide, secured at right angles, which when towed from a boat keeps a steady depth according to the length of the towing line. When the depth of water is less than that to which the sentry is set it strikes the bottom and rises to the surface to give warning of shallow water; a device used by generations of surveyors for feeling their way in uncharted waters.

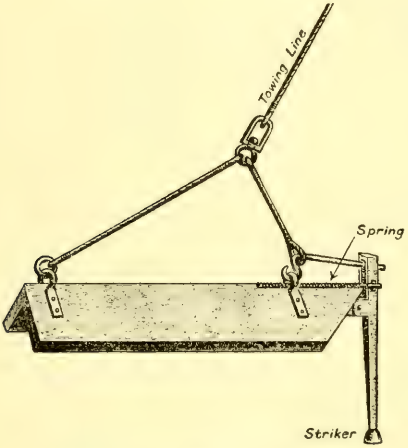
The sentries soon tripped and the boats then commenced a search for deeper water; it was not until 5 o'clock that they found a passage with six fathoms of water through it and the ship was able to proceed. The boat's sentries tripped again in the Narrows between Tuktuinak Islands and Tunnungayualuk. The ship anchored while they searched for a passage, which they eventually found, and then went on as far as Achpitok Island where, at 10 o'clock at night, she brought up in 18 fathoms between the island and the mainland.

By Thursday rainy weather had set in. The ship weighed anchor at 4.30 in the morning and stood across to Dog Island through a lead in the ice. The existing chart was wrongly orientated here but a channel was followed between Nochalik and

Kikkitavak. With a boat running a sentry ahead the ship passed through the Taktok Tickle and then north-westward for the channel between Palungitak and Paul Islands, where she came to anchor and a boat was sent to sound out and buoy the channel through.

The area where the survey of the coast was to be commenced had now been reached, and all eyes on the bridge were alert to see any site ashore which would be suitable for the base line measurement.

There are three basic essentials to an original survey. First a suitable stretch of land, at least half a mile long, must be found and levelled. On this a base line will be carefully measured with steel tapes to establish the scale of the survey. Next the geographical position on the earth's surface of some point within the area of the survey must be fixed by taking star sights, usually with a surveyor's astrolabe. The position of this point in relation to the base line can be found by measuring the angles of the triangle it forms with the base line. But the orientation of the survey still remains to be found. In other words the direction on the earth's surface of the base line (or any other line on the survey) is still unknown, and this is established by measuring the angle between a line joining any two points and the sun (or a star), knowing



The Submarine Sentry

the exact time at which this reading is taken. This is known as a true bearing between the points. Stations marked by flags on poles, or by tripods boarded up or filled in with calico, are then established, usually on the higher ground, throughout the area to be surveyed. By measuring the many horizontal angles contained by the numerous triangles thus established the relative positions of all these points are found. The geographical position of each can be found by referring all stations to the position fixed by star sights and the position where the true bearing has been observed. This framework is known as the triangulation and to it all the details of the survey, soundings and topography are fixed as the work proceeds.

No really suitable place was found for a base on Paul Island and so, when the boats had sounded out the channel, the ship went through and came to anchor in Nain Bay at 9.30 at night, one week out from St. John's, Newfoundland. *Challenger*'s arrival at Nain was popular with the few inhabitants of this little Hudson Bay trading station, as she was the first steamer to get north through the ice this year, and the mail she brought was very welcome. Nain lies well protected from seaward by numerous islands, the largest of which, Aulatsevik, lies to the north-eastward. A narrow channel, or 'run', as it is called, divides this island from the mainland and leads to Port Manvers about 20 miles northward. Local opinion seemed to agree that the ship could pass up inside this Port Manvers Run although there were two 'rattles' to be negotiated. (A rattle is a narrow channel through which the tidal stream flows so fast that an appreciable noise is made by the water.) Local opinion also agreed that a flat expanse of land lay on the south side of Port Manvers which seemed suitable for the base measurement. There was no hope of reaching Port Manvers by the outside route for some weeks, pack ice being solid right into the coast of Aulatsevik. So on the morning of Saturday, 16th July, the ship steamed up the Port Manvers Run, experiencing no difficulty until the second rattle was reached about two miles from Port Manvers. Ice floes were drifting through the rattle on the tidal stream, so the ship was anchored and a boat sent to investigate. She located a navigable passage close to the eastern shore and later led the ship through, but on rounding the point it was seen that the whole western entrance to Port Manvers was jammed solid with ice, and there was nothing for it but to turn round and go back down the run to an island about eight miles from Nain, which had been noted as a possible base measurement site.

Navigation 'down north' by the inshore route has been described at some length to show the risks which had to be run in 1932, and in the following two summers, in order to get to the survey ground as soon as it was sufficiently clear of ice for survey work in the very short season, which lasted only from mid-July until early November.

The base site having been chosen, the survey went forward in earnest. On the evening before a day of surveying, the Captain makes his plans, stating broadly in his surveying order book what work is to be done and which surveying officers are to do it. The First Lieutenant then assesses how many men and what boats will be required for the various tasks, and then, with the Coxswain, he details the men for each party; these are not confined to any particular branch in the ship—seamen, stokers, the sick bay attendant, the officers' stewards or even the ship's cooks may be sent on this work if they volunteer for it. To an outsider there appears to be a certain degree of chaos in the early stages of a survey; parties go off every morning after an early breakfast, taking with them their dinner, together with a quantity of gear, such as poles, flags, calico, rope, hammers, spades, mauls, bolt staves and axes, maps, charts, binoculars and prismatic compasses.

A surveying ship usually carries about six or eight boats of various types and sizes, and all these may be away on any one day. It is an animated scene in the mornings, particularly when a strong wind is blowing and the boats alongside are heaving up and down, as the assorted equipment is handed down and passed into the boats, the petty officer or leading seaman in charge seeing that the gear of each party is not irretrievably muddled with that of another party. At the appointed hour, 7.30 or 8 o'clock, the boats, with their crews clad in many assorted rigs, each man wearing what he thinks most appropriate to the weather conditions prevailing, and towing dinghies or dories for landing on the coast, cast off and head away towards different points on the horizon. As they become smaller and smaller and finally become a tiny dot in a white flicker of foam the Coxswain heaves a sigh of relief and goes below to stop the rum tots of those who have gone off surveying for the day, nothing being more infuriating to the sailor than to find when he returns, after a day in the field, soaked to the skin and dead tired, that he has a 'cold' tot, one that has been mixed with water since midday due to the failure of those onboard to realise he is away for dinner.

On this first day of the Labrador survey a large party of surveying officers and men went ashore to prepare the base for measurement, while other parties were marking the proposed triangulation stations on the mountain tops, some of which are as much as 3000 feet high; such heights take a deal of climbing, starting from sea level laden with spars, ropes and iron pegs for erecting the mark on the summit. The first few hundred feet of the mountains were clothed with spruce and after that the climb became steep and rough, the mountain sides being almost entirely barren, even moss and lichens being scarce amongst the huge tumbled boulders. These same mountains would then have to be scaled again, with a theodolite on the back, to observe the horizontal angles between the other main stations and the marks which will by then have been set up along the coastline; and then perhaps again after that if the visibility closes down on the top, preventing observations.

The base measurement party had a formidable task ahead of them; part of the proposed base lay over stony, rough ground while the remainder of the distance was across a swamp. It was the best that could be found in this rugged country. Three days' work was required before the hard ground had been levelled and an earth causeway built across the swamp to take the steel tapes.

The measurement itself must be made with great care; even the temperature of the tapes and the tension upon them must be taken into account. It is a careful and unhurried process.

All surveying parties cursed the black flies and the mosquitoes which swarmed on the exposed parts of the face and body: head nets and gloves were essential but, if the head net was allowed to touch the face at any point, that part of the net would soon be black with flies irritating damnably. Only when a strong wind was blowing was there any respite from these pests.

Rain fell heavily and steadily throughout these early days and sometimes the whole of the base line area seemed to be under water. A portable galley had been rigged ashore to provide a good midday meal for the party, and the junior ship's cook had been established in a tent to do the cooking. He had never cooked under such conditions before and soon he came out into the pouring rain carrying a little billycan: 'Where do I go for water?' he asked a seaman who was drenched to the skin. 'Water!' shouted the sailor. 'Why, you just keeps on walking till your ruddy cap floats.'

How do the men like this kind of work? The great majority find it a welcome break from life in the Fleet for it is certainly something altogether different, and in the days before the war, when the drafting authorities did not appear to be so tied to regulations, surveyors were allowed to keep the same men in the ship commission after commission if they volunteered to do so —which many of them did. Those who really like the work can become Surveying Recorders, which means that they will always serve in surveying ships. Such men are trained in the simpler surveying work and are invaluable leaders, who are able to teach the newly appointed surveying crews what surveying is all about in the first baffling days of a new commission.

Through August and early September the work went forward, the base was measured, a party in camp observed stars with the astrolabe after waiting many nights for clear visibility; and then, the position being known, a true bearing with reference to the sun was observed between two of the triangulation stations in the survey. Two and sometimes three camp parties were established in the Port Manvers Run area and on the barren islands to seaward. The pack ice had cleared and the ship was often under way among the islands, navigating day after day in uncharted waters.

Apart from the day-to-day organisation of the hill marking and theodolite observing teams, there was the welfare of those in camp to be thought of, replenishment of the camps with food and sometimes water on the more barren islands, and there was wood to be chopped on the mainland and carried to camps where no wood existed.

The Doctor Forbes Air Survey seaplane and a party in an attendant schooner arrived one day and provided welcome new faces; besides which the seaplane took a number of air photographs which were of considerable assistance in the survey. Commander Wyatt was taken up for a reconnaissance flight over the area. The day of his flight was fine and clear and he described the scene; the islands along the coast were almost literally innumerable and the general appearance from aloft of the relation between land and water was that of pieces of a jig-saw puzzle scattered over a blue cloth. The country inland was exceedingly rough, well wooded in parts, but broken up by many inlets of the sea, some running thirty miles or so inland, and with lakes and ponds scattered everywhere and at all levels. The immensity of the survey task was fully apparent from this height.

Leaving a camp party at Nain, the ship hurried to Halifax at the end of August for fuel and provisions and then down north again, now using the easier outside route.

Back on the survey ground the triangulation was carried seaward on the chain of islands, and, with all the officers except the Boatswain either away in camp or with daily survey parties, the Captain was alone all day on the bridge as the ship moved from one island to another, picking up parties from one point so that they could be landed elsewhere to observe there. The ship moved amongst a labyrinth of uncharted islands, rocks and shoals, feeling her way, constantly under helm, and sometimes, with breakers ahead, having to come astern or turn round and try another passage.

A secure anchorage was found at Ford's Harbour and thither the ship often made her way back as dusk was falling, only to be under way again at the first light of dawn. On Friday, 23rd September, she weighed and left Ford's Harbour at daylight and steamed northwards at nine knots to land a theodolite observing party on an island about eight miles distant. She was taking a route which she had followed in safety twice previously and where no dangers had been located by echo sounding or by the man looking out from the crow's nest (such a look-out was always posted in these waters). The Captain was alone on the bridge except for the rating watching the echo sounding machine who called out the soundings every 20 seconds. The soundings were between 50 and 30 fathoms, but suddenly a sounding of 21 fathoms was called, and the water then shoaled so rapidly that the echo was momentarily lost, and before another sounding could be called the ship shuddered as she struck a rocky shoal. The engines were stopped and put to full astern with no effect. Abreast the bridge the ship was hard and fast, while at her bows and stern soundings showed deep water; truly this was a pinnacle rock.

This was indeed a serious predicament, the ship firmly aground in a remote part of the Labrador coast with the nearest help over a thousand miles away and the amount of damage done to the ship's hull difficult to assess. *Challenger* must now rely entirely on her own officers and men and they did not fail her.

A boat having sounded round the ship it was decided to attempt to get the ship off stern first at high water, which was due in about 4½ hours' time, and might give about two feet of water more than when the ship grounded. Time was short and work commenced at once. First the damage was inspected as far as this was possible inside the ship, and then wooden shores were placed against all the adjacent bulkheads, the damaged compartments themselves being sealed off by their own watertight doors. It appeared that all the forward oil fuel and fresh-water tanks were leaking and that the large provision room and canteen store were flooded with oil fuel and water, and further, that there was a slight leak in the forward end of the boiler room which was situated abaft the provision room. This damage must be localised as far as possible so that when the ship floated off the reef the minimum risk of further damage might be incurred.

Meanwhile the two ship's anchors were lowered below the water line and slung beneath boats; this was no mean task as each anchor weighed 28 hundredweight. These anchors were disconnected from their cables and when wire hawsers had been secured to them they were laid out astern of the ship and the hawsers brought to the steam trawl winch on the quarterdeck. An amusing incident happened at this point, for when the huge anchors were slipped from beneath the boats the latter regained their full buoyancy with such force that a member of one of the crews was catapulted into the icy water. A smaller kedge anchor was similarly laid out ahead of the ship to steady her.

Just before high water, the anchor cables, now without their anchors, were lowered onto the sea-bed, 14 tons of fresh water and 15 tons of fuel were pumped overboard from tanks in the forward part of the ship and all the crew mustered aft, so that the ship was considerably lightened forward. At about high water the stern hawsers leading to the two bower anchors which had been laid out astern were hove upon and the engines put to full speed astern. It was a tense moment as ever so slowly the ship began to move, and very gently came off the rock. The first part of getting the ship back to port was achieved, but there were many more difficulties to be overcome yet. A hum of eager conversation on the quarterdeck was soon quelled by the Coxswain detailing the men for the task of recovering the anchors. The hawsers running to the bower anchors had now to be led to the forward winch and these anchors hauled up into the hawsepipes once again and connected to the cables. The kedge anchor had also to be recovered before the ship returned to Ford Harbour so that divers could determine the full extent of the damage; meanwhile the pumps were just holding their own with the water in the damaged compartments.

On the next day, Saturday, a strong easterly wind was blowing into the anchorage and it was late in the afternoon before the two ship's divers could be sent down. The whole of Sunday was also spent in diving, while the ship's boats made long journeys to recover the three camp parties who were soon alive with bustle as they took down the tents and packed the bedding, provisions, surveying equipment and a hundred other items that make up the detached survey camp.

The divers had an extremely cold job and they could work only in short spells before warming up onboard and preparing to go down again; but encouraged by the Boatswain and the small party of men who were working the air pump and attending on them, they gradually built up a picture of the damage to the ship's hull and in addition they were able to plug six holes from which rivets were now missing. This allowed the pumps to reduce considerably the amount of water in the damaged compartments.

At daylight on Monday, 26th September, the ship was as ready as she could be to sail for the south, and it was now necessary to take the inshore route again, at least until it was certain that the plugged rivets were holding satisfactorily. To encounter heavy weather such as could be expected in the open sea might cause further damage, particularly to the forward bulkhead of the boiler room, which might be flooded with the most serious results. Both *Challenger*'s boilers were in the same boiler room, fitted side by side.

So once more the boats swept ahead of the ship with the submarine sentries for two long days as the ship sailed southwards through the islands to Cape Harrigan. Halifax seemed a very long way away to those who were anxiously watching the damage and nursing the vessel every mile of the way. The Commander-in-Chief of the West Indies Station had been kept informed of the ship's plight and on Wednesday she met up with the naval sloop *Heliotrope* which had come north to stand by. *Challenger* had felt very much alone during these last few days and all onboard were glad to know that now they were being looked after.

The glass began to fall and the wind was freshening from the south; such weather might soon increase the damage, so the two ships anchored in Domino Run for shelter. There they remained weather bound until Friday, when a lull permitted them to go on to York Harbour in the Bay of Islands, Newfoundland, where again shelter had to be taken. Never more anxiously had those onboard watched the barometer and the freshening wind. After a false start on Sunday, when the swell in the open sea forced them to return, they eventually sailed on Monday and reached Halifax on Wednesday without further mishap. Here they were received with generous assistance afforded by the Royal Canadian Navy, and the ship was docked a few days later for extensive repairs to be carried out by Halifax Shipyards Ltd. It was not until 18th November that she was ready to sail home to Portsmouth.

The Lords of the Admiralty considered this case of grounding and decided that no blame was attributable to anyone for striking an uncharted pinnacle rock in such difficult waters; furthermore, they considered that the Commanding Officer had acted in a seamanlike manner in getting his ship afloat and carrying her to Halifax, and commended Mr. H. Good, the Engineer Officer, and the divers for their fine work.

The Hydrographic Department placed 'Challenger Rock' on the charts of the Labrador Coast.

III

Windward Isles and the Grenadines

WITH its 4000 navigational charts, the British Admiralty claims to have world coverage; and although a large proportion of these are based on original surveys made by earlier British hydrographic surveyors, they are kept up to date and new charts made from British and foreign government surveys. Hydrographers generally are generous in their exchange of information and the international goodwill existing in this field can be equalled only by the similar free exchange of ideas and information among the world's oceanographers and astronomers. International politics could profit from these examples.

All the British Dominions, except Ceylon, now have their own hydrographic services, leaving the Hydrographer of the Navy responsible for the charting of British Home waters and those of the British Colonies overseas. Even today this is a very formidable task, difficult to envisage until one realises how much of this area is still imperfectly surveyed; in addition much of the earlier work requires re-surveying with modern methods and equipment to bring it up to the standard required for modern charts.

The Hydrographer keeps constantly under review those areas which require survey, and it needs considerable foresight and thought to decide which areas should be tackled next. The Hydrographer is responsible that both the Royal and the Merchant Navies receive the up-to-date charts they require, and to a lesser extent he must be prepared to assist the Colonial Office with surveys which may be needed to foster new developments. For naval requirements an eye must be kept on the future, judging which anchorages and passages will be of the greatest importance in any emergency or future wartime activity. The opening of a new oil refinery in a remote place may mean that there is a sudden call for up-to-date charts of an area which has been little surveyed: these eventualities must be foreseen and thus the surveyor oftens finds himself working in a little known part of the world which within a few years will have become a busy development area. It is of no use to build a new commercial harbour to handle oil, timber or even ground-nuts if the outer approaches are found to have shoal water preventing the use of the harbour by the deepest draught ships which can be expected in the future.

With these possibilities in mind and always with more surveys to do than there are ships, the Hydrographer juggles on paper until the programme for each ship for the forthcoming season is decided. Hydrographic Instructions are then drawn up for each Commanding Officer, the instructions being addressed to him personally and covering the broad outlines of the surveys to be carried out during the season, usually leaving all details of administration, such as fuelling and provisioning arrangements, and the order in which the surveys are to be done, to the Commanding Officer. He will make his own plans, suitable to the weather and other local conditions prevalent in each area.

It is interesting to compare the opening sentences of the Hydrographic Instructions of a hundred years ago with those of today. The following is an example of the language of the earlier days:

> Strong representations having been made to H.M. Government of the rapidly increasing traffic between our Australian Colonies and the western Coast of America, and moreover of the inadequate knowledge we possess of the intervening navigation amongst its insulated rocks and intricate clusters of islands which extend to the eastward of New Caledonia, and considering the great benefit that distant commerce and maritime enterprise would derive from a thorough examination of that region, from having its dangers fully explored, and from having its harbours so charted and described that the Seaman could know where he would either obtain supplies or repair to for refit or refuge, or endeavour to fix his whaling or his coaling stations.
>
> We have therefore thought proper to select you for the purpose of carrying out these important objects and have appointed you to the command of H.M. Ship Herald, and we have also placed H.M. steam tender Torch, commanded by Lieutenant William Chinnco, under your orders to act as your consort and to pioneer you in doubtful ground and shallow waters—both vessels being amply furnished with Stores, Instruments and comforts of every kind. . . . (Orders for Captain H. N. Denham, R.N., 14th May, 1852.)

The passing of such an explicit and encouraging opening must be regretted. Today they read rather more prosaically:

> Having completed your refit and the drawing of the Fair Charts of last season's work, and being in all respects ready for sea, you are to leave Portsmouth on Monday, 10th April and proceed to the Grenadines, West Indies, where you are to take in hand the following survey . . .

And, in fact, that is how the Hydrographic Instructions for Commander Wyatt read when he received them in early February 1933.

Although the Labrador survey was to go forward, it was impossible to get in through the ice much before mid-July and it was expected that freezing over would force the survey to be discontinued about mid-November. This was a short season indeed and Commander Wyatt had discussed a plan with the Hydrographer whereby a winter party would be left ashore in Labrador in November until the following July. It seemed that such a party might expect to make considerable progress in both triangulation work and in coastlining; with the sea completely frozen over the theodolite teams would be able to move across from one island to another by sledge, and plotting the coastline could be done by sledging along the edge of the frozen sea rather than by walking over many miles of broken country as would have been necessary in the summer time.

But conditions during such a winter would be extremely severe and it would need men of character and endurance if much useful work was to be accomplished. *Challenger* had these men: 'Number One', Baker, would lead the team with Lieutenant D. W. Deane as his assistant surveyor. Surgeon Lieutenant Commander E. W. Bingham had now been appointed to *Challenger*; he had much previous experience of work under such conditions, having been to Greenland with Gino Watkins, and he was known to be a good man with dog teams on which the work would very greatly depend. These men, together with Petty Officer Stevenson, were well suited to lead others under the rugged conditions to be expected, which to say the least of it were novel to the seamen who were to make up the winter party.

However, few were thinking of the winter in Labrador as

THE
CARENAGE,
ST. GEORGE'S,
GRENADA

Above: LIEUT.-COMMANDER BAKER AND OFFICER'S STEWARD HOLGATE STARTING OF FOR A DAY'S SURVEYING.

Below: PETTY-OFFICER STEVENSON FEEDING THE DOG TEAMS

Challenger steamed into the beautiful harbour of St. George's, Grenada, on a steamy morning in early May. The Captain was thinking of the call he would shortly have to pay on His Excellency the Governor of the Windward Isles, who resided at St. George's; laying out his white No. 10 uniform which he would be wearing for the call his steward was thinking of all the 'dhobeying' he would have to do now that the officers and ship's company were to be wearing whites for some months; Number One was thinking how hard it was to get Perkins, the coxswain of the motor boat, to look neat and clean for such an occasion, as this good seaman sat in the stern sheets of the motor boat which was about to be lowered into the water at a sign from the bridge; Ordinary Seaman Clarke was thinking of the 'blast' he would be getting from the Boatswain as soon as he heard the anchor leave the hawse pipe: Clarke's job was to see that the rope ladder, now neatly rolled against the guardrail, ran clear when the others hauled out the lower boom to which the boats secured in harbour—but it always fouled something and held back the boom, ruining the whole evolution, as the Boatswain forcefully told him; and Stoker Pierce, sweating in the engine-room, was thinking of the warm, earthy smell of the land, and the crunch of gravel under his feet as he made his dusty way along the seafront looking for the inevitable bar, not knowing on this first night where to find it—but once he had found the right joint and had settled down there would be rum, happy dusky female company and music stretching into the long tropical night ahead.

The ship's company were experiencing that excited anticipation of visiting a port for the first time, an experience which never palls, and which makes seagoing always something of an adventure.

The white houses of the town were scattered higgledy-piggledy among the palm trees on the lower slopes of the rounded hills surrounding the Carenage, while above the town the palms gave way to thick dark-green, bosky trees. Seen from the ship at anchor the town has a pleasing aspect and the schooners lying with their sterns to the wooden quays before the old-fashioned warehouses bring thoughts of earlier days.

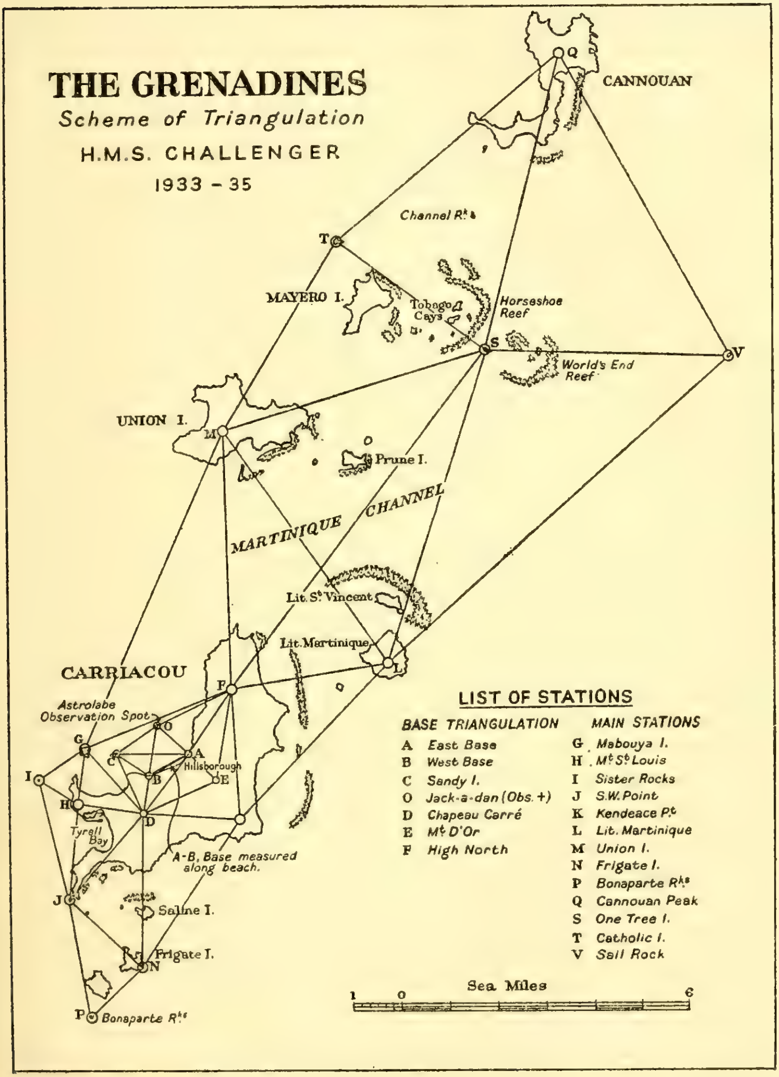
The ship had already visited Carriacou in the Grenadines some 45 miles to the northward along the arc of islands forming the Windward group. The work in the Grenadines was to chart a number of extensive anchorages for large vessels which appeared to exist among the smaller islands such as Carriacou, Little St. Vincent and Little Martinique.

The early operations were the same as on other surveys: a base had to be measured, astrolabe sights had to be taken, and then, a true bearing having been observed, the triangulation had to be schemed and carried on to the hilltops, here much covered in trees, scrub and cactus. So instead of the cold, rugged, climbing of Labrador there were long days here spent clearing the bush so that the various triangulation stations should be inter-visible. And a camp party were thus engaged at this moment while the ship lay in St. George's and the crew relaxed ashore. After the week-end the ship returned to the survey ground and once again the ship's company were in the throes of the activity which is attendant upon the early days of a survey.

During the first week the base measurement was the most important work; the day temperatures being too high for accurate measurement with the steel tapes, only the early mornings and the late afternoons could be used for carrying out this work. Also during the first week the star sights were obtained with the astrolabe.

On Carriacou clear starlit skies permitted observing all night long and the native people were amazed to see lights flickering far into the night on Jack-a-dan Island. Inside the instrument tent the chronograph operator cursed the hundreds of tiny flies, moths and flying beetles which were attracted by his kerosene light and which fell with a click into the back of the chronograph or became lodged on the rollers guiding the paper and jammed these in the middle of a successful series of observations, to the unreasoning fury of the observer at the astrolabe outside. Sometimes in a lull between stars the observer would come into the tent for a tot of whisky, for there is nothing like this to make the stars twinkle in the telescope.

As dawn was breaking each day, those who had been observing through the night turned in on their camp beds in the cool tent and slept as the sun rose and the shadows fell away; but later the tents became so hot that further sleep was impossible and they turned out to meet the fierce glare of noon and to feel the sand hot beneath their feet as they went down the beach for a bathe.


THE GRENADINES
Scheme of Triangulation
H.M.S. CHALLENGER
1933 - 35
CANNOUAN
Q
Channel Rk
T
MAYERO I.
Tobago Cays
Horseshoe Reef
S
V
World's End Reef
UNION I.
M
Prune I.
MARTINIQUE CHANNEL
Lit. St Vincent
Lit. Martinique
L
CARRIACOU
F
Astrolabe Observation Spot
O
G
C
A
Hillsborough
B
E
I
H
D
Tyrell Bay
A-B, Base measured along beach.
J
Saline I.
Frigate I.
N
P
Bonaparte Rks
LIST OF STATIONS
BASE TRIANGULATION
A East Base
B West Base
C Sandy I.
O Jack-a-dan (Obs. +)
D Chapeau Carré
E Mt D'Or
F High North
MAIN STATIONS
G Mabouya I.
H Mt St Louis
I Sister Rocks
J S.W. Point
K Kendeace Pt
L Lit. Martinique
M Union I.
N Frigate I.
P Bonaparte Rks
Q Cannouan Peak
S One Tree I.
T Catholic I.
V Sail Rock
Sea Miles
1
0
6

Scheme of Triangulation

When the triangulation was complete the ship and boats commenced sounding the area to the west of Carriacou, the two boats working from a camp established at Hillsborough, a village on the west side of Carriacou. Twice during May and June the ship had to go to Port of Spain, Trinidad, for fuel and on such occasions she left the boats working from the camp at Hillsborough, which was now well established, having friendly relations with the inhabitants of the village where exciting football matches were played on a sandy pitch thinly covered in grass, near the seashore, these matches being enthusiastically followed by the great majority of the villagers.

Early in July the camp party was embarked, the triangulation flags on the hills taken down and the sites of these stations permanently marked by brass plates set in concrete. The western part of the survey was complete and the ship sailed on 5th July for Halifax, Nova Scotia, and Nain in Labrador to carry on with last year's survey there.

Although the ship reached the coast of Labrador on 21st July, only about a week later than the previous year, the ice situation was much clearer this year and the passage northwards simpler. The ship anchored in the Davis Inlet so that the Captain might visit the senior Hudson Bay Company trader here to make early arrangements for winter clothing and other supplies needed for the winter party and required to be sent north to Nain. He was not the only visitor to the store as a party of Nascaupee Indians, numbering about 80, were camped along the shore making their summer visit for trade with Hudson Bay Company and to meet the Catholic priest. They appeared filthy and were clad in rags of deerskin; their dwellings were of both the ridge and the pointed type of tent, covered with any old canvas, with a hole in the top from which issued smoke from a fire within. From the ship, watching through binoculars, it was amazing to see up to a dozen Indians coming out of a tent which one would have thought would be crowded with two persons inside. The H.B.C. trader was the only white man in Davis Inlet; he had two or three native assistants. There were no Eskimos here. The Indians come and go, travelling and hunting the country from Ungava to the St. Lawrence River. For travel they used light canoes weighing about 50 pounds so that they might be carried easily across land; such canoes were built of light laths of larch laid as frames and covered with painted canvas, which they obtained in exchange for furs in the H.B.C. stores.

The next day the ship again reached Ford's Harbour where nine months earlier she had been licking her wounds after her encounter with Challenger Rock. The poles marking the triangulation stations, which had been left on the ship's hurried departure last year, were still standing and could be seen on the hilltops. Next morning parties were away putting new flags on these poles from which the winds of winter had removed every trace of the old.

A conference was held onboard at Nain to which Mr. Grubb, the missionary, and Mr. Clarke of the H.B.C. store were invited so that arrangements could be made in good time for the winter party, who were to have their headquarters in Nain. It was arranged that the party should live in the small unused wooden hospital, which appeared sufficiently large to accommodate them and to leave room for a chartroom for plotting the survey work. Arrangements were made to start collecting the dogs which would be required for hauling the sledges or 'komatiks', as they are called. In summer time the husky dogs are either placed on small uninhabited islands where they have to fend for themselves, going down to the water's edge to catch their own fish, or they may be incarcerated in the centre of the settlement in square stockades made of logs placed vertically to form the walls. Into this compound cod heads and other fish offal are thrown from time to time, and the level inside the stockade and the smell outside it rise steadily during the months of summer. When the dogs are released with the first snows of winter they are so wild for the first few days as to be uncontrollable. Dogs were reported scarce this year due to sickness but it was thought that the requisite number would be available by November.

The komatiks which the dog teams pull across the ice and snow through the long winters are of the simplest construction, being formed of two long fore-and-aft wooden runners shod with iron, with cross boards secured between them on the top along their entire length to form a platform.

The marks having been for the most part fixed last season, the ship and boats were able to press on with the sounding work, while parties landed daily to delineate the coastline, all such sounding and coastlining work being fixed in relation to the triangulation marks.

One morning when the ship was surveying off Nain a boat came out towards her and a burly man hailed her from a position in the bows. He was the Master of the American schooner *Minnie B* lying in Nain. He requested the Captain's aid in arresting his crew who had deserted in Nain and were now in the settlement, but the circumstances did not appear to the Captain to warrant their arrest. However, it was most undesirable to have a number of unemployed white men hanging round a settlement where there was no accommodation or any amenities, and it was lucky that the Newfoundland steamer *Kyle* was due in a couple of days' time and arrangements were made with the master of the *Kyle* to take these men to St. John's, Newfoundland, while the Master of the schooner remained onboard his vessel.

The Secretary of State of Newfoundland and a Customs official happened to be travelling onboard the *Kyle* and the dissatisfied deserters must have talked on the passage to St. John's for a signal was received from the Secretary of State ordering the Captain of the *Challenger* to detain the *Minnie B* on suspicion of illicit trading and obtaining customs clearance under false pretences. So on Sunday morning an officer from *Challenger* boarded the schooner and, to the consternation of the skipper, removed the ship's papers, her sails and essential engine parts, and he seemed little mollified by the offer of the Captain of *Challenger* for him to use her radio to get in touch with his consul.

The mosquitoes were as bad as ever and three cases of septic mosquito bites developed among the ship's company, one of these being the ship's Medical Officer. As he was unable to carry out a satisfactory operation on himself, the ship had to sail south to Cartwright, where a hospital was supported by the Grenfell Mission.

Whilst lying at Cartwright the *Kyle* arrived with the Customs Officer for the East Coast of Labrador and a magistrate onboard bound north to try the case of the *Minnie B*. So the ship's papers, sails and the engine parts were handed over to the Customs Officer and *Challenger*'s police duties were over.

The ship had left both boats operating from a camp south of Nain and was unable to wait for Bingham to recover fully, but he made his own way down the coast in a local open boat, being storm-bound several days in windswept anchorages whilst on passage. It was a good thing that Bingham was used to rugged travel, for he was none the worse after this ordeal. He was welcomed at Nain with open arms because his boat brought the mail, the mail steamer having made her last run north of Hopedale for the season.

At the end of September the ship, leaving a large camp party with both sounding boats in a landlocked bay south of Nain known as Kauk Harbour, sailed south to Halifax for fuel and large stocks of provisions needed for the winter party. By 12th October, in the first flurry of winter snow these stores were being disembarked at Nain. From now onwards the survey work was much hampered by snow and gales; on 2nd November the temperature was down to 19°F and spray was freezing as it fell on the canvas canopies of the boats which were away placing secondary marks along the coastline for the use of the winter party.

While one of the boats was being hoisted on this day a brand new fall parted in one of the blocks: as the whole weight of the boats is taken by these ropes it was fortunate that no one was hurt and that no damage was done. On examining the fall it was found that owing to the low temperature the tarred fibres had become frozen and brittle so that, when bent, the rope snapped like a stick. So from now on falls had to be unrove after hoisting or lowering a boat and stowed below until required again, a most unpleasant nuisance in such conditions.

On 9th November strong westerly winds were blowing the snow off the hills like smoke and next day the ship proceeded to Nain to establish the winter party. The temperature was down to 13°F and ice was forming around the ship's water line. All the stores were ashore and stowed in the old hospital at Nain by the evening of 14th November and the party said farewell and went onshore. The next day the glass fell very low—to 956 millibars—but there was no wind until the afternoon when it began to blow from the south-west and gradually increased to a gale at night. The temperature fell to 5°F onboard and to zero ashore and, when an attempt was made to veer more cable, it was found that the windlass was frozen solid, and on the morning of 16th November the sea was 'smoking' prior to freezing over; it seemed high time to be away. A fire had to be lit under the windlass before the cable could be worked, but once that was freed the ship was soon heading for the open sea in a fresh gale and a snowstorm. There were not many who were sorry to be homeward bound for Portsmouth from this inhospitable coast, where nine members of the ship's company were preparing to see the long winter through.

IV

The Winter Party

The old hospital at Nain was to be the base camp for the winter party from November until July; it had a good stove, and provided sufficient wood could be collected it would remain reasonably comfortable throughout the winter. To carry out the survey work it was planned to send small survey teams into camps in the area. These camps would be housed in light arctic tents and occupied for a matter of two or three weeks, after which the teams would return to the base in Nain. It was realised that life in the camps in the depth of winter would be extremely hard and the teams would probably need about ten days or so at the base camp to plot the survey work completed in the field and to prepare the gear for the next camp party.

As the ship steamed slowly out of the bay and sailed for home the winter party turned to their immediate tasks. The hospital was scrubbed out and shelves and hooks were erected to take the stores and the winter clothing; the chartroom had to be rigged and provided with a table, chairs and racks to take the instruments; and the most important work of hauling in the firewood and stacking it in readiness for use had to be started at once. Meanwhile, the ice began to form in the Bay, at first very thin and easily broken up by the slightest wind, but on 22nd November news came in that the Port Manvers Run was completely frozen over except for the rattles, and that people were able to walk on the ice there. Sledging would soon begin.

The population of Nain consisted of a number of 'settlers' of European extraction and some Eskimo families, some living in the settlement and others in huts, built as fishing and hunting camps, tucked away in odd corners, at the head of an arm of the sea, or close under a sheltering spruce coppice. These dwellings were scattered thinly over the empty landscape. Some of them had long since been given up as regular dwellings but were found to offer some shelter to winter travellers to whom any protection from the freezing, numbing winds was very welcome. The settlement of Nain itself consisted of a number of well-built white wooden huts clustering along the shore near the neat little church and the Hudson Bay Store, while to the north were a number of ruder wooden huts stretching towards the spruce woods on the lower slopes of the rocky hills. The hospital was one of the more imposing buildings, having two storeys and dormer windows in the roof.

The winter party consisted of Lieutenant-Commander Baker in charge, with Dennis Deane as his assistant surveyor, a cheerful and amusing person; then there was 'Doc.' Bingham, who was a Surgeon Lieutenant Commander; and the ratings consisted of Petty Officer Stevenson, Leading Seaman Hampson, Able Seamen Marshall and Marlowe, and, lastly, Officer's Steward Holgate, all of whom had volunteered for this winter in the north but of whom only Bingham had experience of dog team driving, the use of snowshoes and of living under arctic conditions. There was much to be learnt, and the party were soon making their first floundering steps on snowshoes, while they tried out the winter clothing, the windproofs and the sealskin boots and the sleeping bags.

At the same time there was hunting to be done, for hunting is a necessity of life for all who live in the far north; seals must be killed for the feeding of the dogs, which had by now been acquired and which lay in the snow around the base camp awaiting the first trial sledging journeys. As the ice forms in the bays in the early stages of freezing over and is broken up by the wind it is driven in towards the beach, these blocks forming a jumble of oddly shaped ice boulders, known as 'billycaters', and it is by crawling through the cover afforded by these that one can sometimes come within rifle range of the seals lying on the seaward edge of the ice.

Henry Voisey, one of the local settlers, was taken on as camp servant. He was a good man with dogs and had his own team, and he knew the country well.

Baker at once decided that he should be ready at any time to send out a party capable of living unsupported for at least seven days, so a number of 'camp boxes' were made up and kept in readiness to be loaded onto a komatik. These boxes contained saucepans, a frying pan, a tin opener, a primus stove and knives and forks, etc., sufficient for two persons, while a 'ration box', which would also have to be taken, contained concentrated rations sufficient for two persons for seven days and included such items as 6 pounds margarine, 6 pounds pemmican, porridge oats, plasmon biscuits, pea flour and cocoa, etc. The seamen of the party, used as they were to the loaded plates of roast meat and potatoes which they prepared for themselves and the heavy duffs which followed when they fed in *Challenger*, whether the ship was on the equator or off the coast of Iceland, looked with disappointment at the apparent inadequacy of the rations, not realising how concentrated they were.

Buck decided to go with Doc. and a dog team to establish a camp for a week so that they might judge what the conditions would be in a survey camp and what the snags might be. So on 29th November, having loaded the komatik with a camp box, a ration box, tent and sleeping bags, they set out on their first sledging journey, with Buck's and Bingham's teams harnessed together, to make camp, after four hours' travelling, on the shore of a saltwater lake. And here for a week, shooting ptarmigan for winter use, and fishing through a hole in the ice for cod to feed the dogs, Buck and Doc. acquainted themselves with the difficulties and the conditions which would be experienced by those occupying the survey camps during the long winter months ahead.

The tents were of a new arctic pattern, having a double skin and a ventilator in the outer canvas which could be opened by a cord from inside; but when the primus stove was out it was found that hoar frost formed both on the inside and between the two skins, making the tent very damp when it thawed on the primus being relit. So tubes were sewn from the inside to the exterior ventilator, thus reducing considerably the amount of hoar frost forming whenever the temperature in the tent was allowed to fall. By spreading deerskin rugs between the sleeping bags and the ground sheet the bags were kept moderately dry and once the sleeper had overcome the sense of suffocation experienced when using the hood he was able to sleep warmly and in comfort even when the temperature in the tent was down to 0° F, as it often was.

Driving the dog teams had also to be practised. A komatik is normally pulled by seven or so dogs which are harnessed by a single bridle which, at some distance ahead of the komatik, has short extensions or traces leading to the dogs on either side of it. From experience it was found that traces and bridles made of $\frac{3}{4}$-inch circumference sisal rope brought from the ship were far easier to manipulate and were also stronger than the sealskin line normally used for this purpose. Little difficulty in the actual driving of the dogs was experienced in the early days, although much practice was required to get used to handling the 45-foot thonged sealskin whips, which, when well manipulated, can be used to flick a delinquent dog in exactly the right place from a position on or behind the komatik; the inexperienced driver often ends up by giving his own cold face a savage cut with the end of the thong.

So the early days passed. The woodpile grew higher and higher, camp and ration boxes were made up and canvas was nailed around the eaves of the hospital to keep out the smallest ingress of chill air.

On 12th December the advance gear for a survey camp—tents and rations, hop poles and flags for survey marks—was hauled by komatiks to the first site selected, at the mouth of a small bay on the eastern shore of Satosoakkuluk, about eight miles from Nain. This gear was cached among the trees at the site and the teams returned to base. It was intended to come out on the following day, but, as was to happen so often throughout the coming winter, the barometer fell during the night and it came on to blow hard from the westward. The visibility on such occasions is cut down to a few hundred yards, which, combined with the bitterness of the wind, makes travel impossible. So the dogs huddled on the lee side of the old hospital and the men lay up all that day, but hauled out to the camp site next day, and having set up the camp carried out a considerable amount of triangulation in the area. A week later camp was struck and the teams had a hard trip back to Nain as the komatik was heavily laden and one dog was sick, leaving a team of six dogs to haul across the Bay against a strong headwind blowing from the west. As soon as the base was reached the party were helped by a number of Eskimos to unharness the dogs and to unload the komatik. This is a local custom; any komatik coming into Nain is always assisted on the last part of the journey by anyone who happens to be around, and when all the gear has been carried into the house the helpers melt away, expecting no thanks for this courtesy, which always made the return to Nain seem like a home-coming and was very welcome after hours of battling with the elements.

Christmas was spent quietly in social activity, visiting Mr. and Mrs. Grubb of the Moravian Mission, Mr. and Mrs. Clarke of the Hudson Bay Post and various friends among the settlers and the Eskimos. The local silver band was much in evidence, playing on their 'grandstand', the roof of the church, where they stood precariously as they blew in harmony.

The 3rd January was spent preparing for the second survey camp and, on the morning of the 4th, a small party led by Baker was away to establish and occupy the camp. Buck's spirited private diary describes the rigours of the surveying work and the day-to-day difficulties of sledging and camping.

> 4th January. It looked as though it was going to be a really good day as the wind dropped away altogether by 0830, but came in puffs from all points of the compass.
>
> It finally steadied in the S.W. and by the time all the gear was lashed to the komatiks by 1000, it was getting up.
>
> We started off and the wind increased to about force 6 before we had got very far, and fairly blew us along.
>
> We got to the camp site by noon and pitched camp in the same place as last time.
>
> During our absence, however, a spring must have burst its way through the snow and ice as Marshall fell through into about a foot of fresh water about 15 yards from our snow shelter.
>
> Henry started building a snow house for us to use as a survey office but made it rather big and with not enough tumble home so that it was impossible to put the roofing on 'à la Eskimo'. I made him pack up about 1530 and sent him back to Nain as I wanted him to get back before dark.
>
> We settled down comfortably and had all the fresh water we wanted for cooking and drinking without the bother of having to melt snow.

> 5th January. A cold day with wind from the N.W. but not a strong one. We all went away coastlining in different directions. Personally I don't think that I have ever had such a foul day, as the wind, although not strong, was darned cold and going against it simply froze one's head and face. I went up wind and coastlined down wind but it was pretty grim as every time one stopped to fix and 'shoot up', one got beastly cold, the sextant telescope

clouded over and this immediately froze and had to be cleared off with the point of a pencil. Taking angles up wind was very trying as it made my eyes water and this, of course, froze too. The temperature was —17 degrees all day. I got back to camp just about ready to commit murder at the slightest provocation.

As the snow house was not completed, Dennis and I had to plot and 'ink-in' in the tent and this was about the most trying thing I have done for a long time. Only one could work at a time and he had to sit on the ration box with the plane table on his knees and tilt it downwards away from him to get enough light to see by. Our eyes ached like hell by the time we finished and we both vowed we would not try it again. Altogether somewhat of a grim day.

6th January. It was snowing to start with so we finished building the snow house, and set off on our coastlining as soon as it cleared up. We used the snow house in the evening for plotting and inking-in and it was simply marvellous compared to a tent. The plotting table consisted of a large snow block laid on top of a beaten down pile of snow in the middle and the light was supplied by two candles lashed to broom handles and stuck in the snow either side of the table. The light given was truly amazing and made work almost a pleasure! The primus stove kept it fairly warm and we slung the bottle of ink on a lanyard to thaw it and keep it thawed. Even so we had to hold the ink over the primus flame every minute or so as the ink froze on the pen while inking-in. We finished the great work by about 1830, and on going out noticed that the spring was quoring up almost into the igloo although this was built on the side of a small hill. After supper I went out to do the usual chores of filling up pots and pans and so on and went up and had a look at the igloo and found the water had risen considerably and also that it had broken out at the back and was threatening the tents. I tumbled the crowd out and we cut a channel to drain the igloo and cut through into a small river which welled up very strongly. I decided to shift camp and we made a quick job of it, shifting it about 50 yards away in lee of a small hill. The whole camp was shifted and settled down again with all primus stoves roaring in three-quarters of an hour. The lads were very cheerful about it and picked the tents up bodily and carried them to the new site, singing some Salvation Army song that is usually sung when the latter carry large banners about. I did not feel too happy about the snow house but, as we had tapped the stream below it, it did not look as though anything would occur.

7th January. It was blowing hard and continued to do so until about 1130 when the wind appeared to ease somewhat. We all had a quick 'mug up' and got away by 1230. It was soon apparent, however, that it was only a temporary ease up, as by the time I had cleared the land it was blowing hard again. Standing up in the komatik with the wind behind me it was strong enough to blow the komatik along and keep the bridle and traces slack over hard wind-blown patches of ice. By the time we had got to the east end of Kruger Island, I could see that we were in for a buster as the snow was being blown off the tops of the hills in Nain Bay. I rounded the point and started to come back the other side of the island, as I thought we might have a lee of sorts.

I was mistaken, however, for very soon it was blowing so hard and with so much 'drift' that I could not see my dogs. It was evident that we were not going to get back stemming that wind and drift so I got ahead of the team and led them up over the top of the hill 180 feet high. They followed like lambs and pulled the komatik up like little Trojans. We careered down the other side and found it was much better as far as drifting snow was concerned, but the wind was so strong that we had to lean against it. We got back to camp by 1530, and on getting up to the camp saw two of Dennis' dogs there and so thought he must have got back before me. I could not see his komatik anywhere, though, and realised that one of his dogs had slipped its trace and run back to camp and that he was out in the gale with only four dogs. I went over the crest of the hill to look for him and told Marlowe not to unharness my team as, if he was a long way off, I would go out with my team and bring him back. I met him, however, just coming up the hill and gave him a hand home. He was breathing fire and murder about his leader, Lively, as he thought he had gone back to Nain again, as he had done on Friday. He was very surprised to find him in camp and forgave him. The other dog, Frank, I knew he had left in camp as it was sore under the forelegs. We were all glad to get back and get into our tents out of the wind.

8th January. It was still blowing when we turned out so I decided to wait and see what the weather was going to do, as the barometer was going down and it looked as though anything might happen.

On going over to the snow house we found to our horror that the water had quored up inside and my guns, harnesses, plane tables, cartridges and other odds and ends were standing in about six inches of half-frozen water. Dennis crawled in and chipped all the gear out and passed it out. We shifted all the surveying gear to a little dip on the opposite bank of the pond that we were now camped on. It looked as though the snow was good enough to build another snow house so we all set to work and had one up by lunch time. It was made more or less in the correct way and was roofed 'à la Eskimo' and was a great success, thanks chiefly to Dennis who did most of the building.

The wind was dying away so we had a hurried lunch and got away by about 1300. We had a good afternoon surveying as the wind died away completely. I did not get back till dark, and we plotted and inked-in in the igloo again and by the time I came out it was snowing. The barometer was falling fast and looked as though we should have bad weather in the near future so we decided that, if it was not surveyable weather on the morrow, we would pack up and go back to the base.

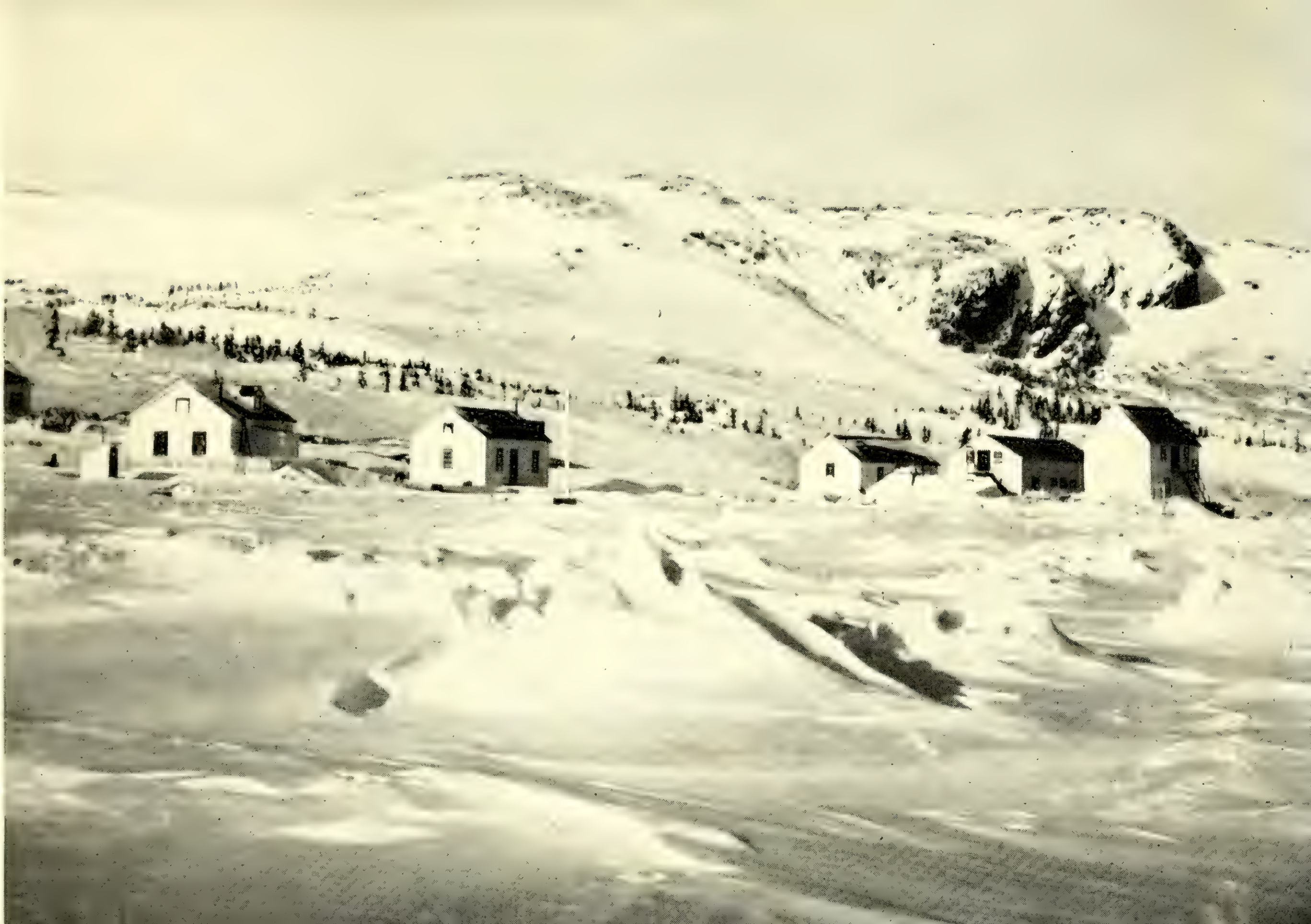
Sure enough the weather was bad and the party struggled back to Nain.

There was plenty of work to occupy the time of the surveyors when they returned to the base camp after a week or two in the field. It seemed that whenever it was decided to establish another camp the weather at once deteriorated; the barometer would fall and the wind and the drifting snow would rise, making travelling conditions impossible; and so, with the komatiks loaded and everything ready to go, the party sat impatiently day after day in the base camp.

It was during such a period that something happened which altered all the immediate plans for the survey. On the night of 25th January Clarke came to see the party and brought with him a certain Mr. Smith, the Hudson Bay trader from Nutak, some 50 miles north of Nain. After two hours of small talk, when they were about to leave, Clarke said that Smith would like to see Buck alone and so they went out into the porch together. Here Smith came straight to the point, asking for Baker's help to quell disturbances which had been going on at the H.B.C. post at Hebron, and which Massie, the trader there, was unable to control. The Eskimos at Hebron were said to be a tough crowd and were a bit of a mixture of a number of families who had settled there.

What Smith wanted Baker to do was to travel north to Hebron with Clarke and himself and arrest an Eskimo named Renatus Tuglavina, who they said was the ringleader of the troublemakers. Baker did not like this idea and said so, pointing out that he had no authority on the coast and really could not act on such vague evidence. He did say, however, that after the next survey camp he might travel north to Hebron and see for himself what was happening and bade Smith and Clarke good-night. He did not sleep well, turning over and over in his mind what should be done. He did not wish to arrive at Hebron either with the Hudson Bay Company people or with the missionary, although he was sure that Mr. Grubb would be willing to go. Baker felt that the Navy should not appear to be the power behind either of these two, and that if he went to Hebron he should go alone.

He decided that Dennis, Bingham and Stevenson should accompany him and that they should slip away quietly for Hebron, where their surprise arrival might do much to steady the Eskimos there. The tents had already been pitched for the next survey camp and, as these would now be required on the journey north, a party was sent out to bring them in, while at the base prepara-



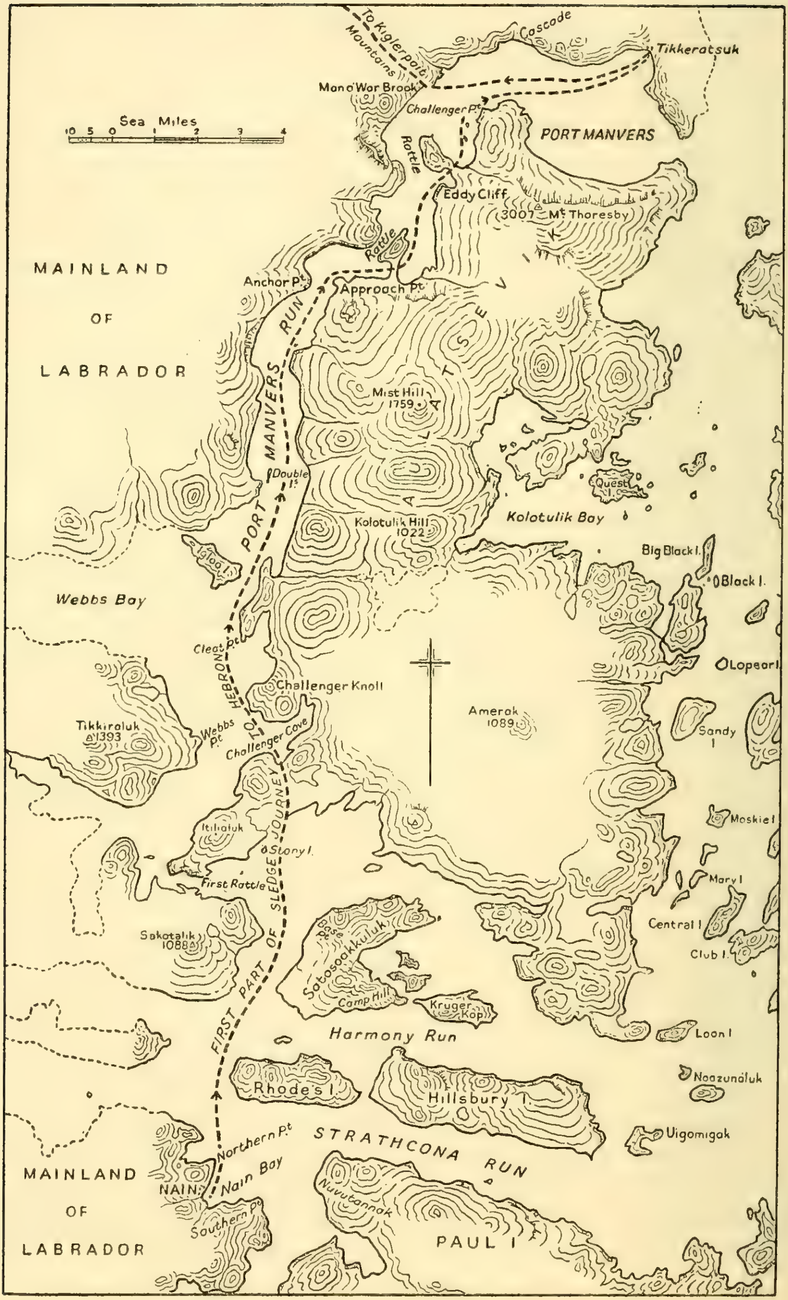
NUTAK—
HALF WAY
TO HEBRON

HEBRON—
THE
JOURNEY'S
END

tions went ahead for this formidable journey to Hebron, 150 miles to the northward beyond the Kiglerpait mountain range which is over 1000 feet high. But, as so often happened when plans had been laid, the barometer fell and high winds prevented the teams starting for the next five days. Only the party knew where the komatiks were bound when the weather cleared and this they kept to themselves, the rest of Nain thinking these preparations were for the establishment of a survey camp. Baker did not want Renatus to get wind of his intentions as he certainly might have done, news travelling fast across these wastes. An Eskimo party tried going out to gather wood on the fourth day of the gale but had not returned by 8.30 at night with the weather as thick as a hedge and with soft snow lying in drifts waist deep. The church bell was tolled to give them their direction and, leaving their komatiks behind in the woods, they struggled in with their teams at 10 o'clock.

On 31st January the weather at last cleared and it was good enough to make a start for Hebron. Three komatiks were taken, Henry Voisey with his team, with Stevenson as passenger, Buck and Bingham with a team of nine dogs on the big komatik, and Dennis with his own team on the small komatik. Smith and Gillingham from the post at Nutak had also been waiting for fine weather to return to Nutak, and they too set out.

The route followed was from Nain, past Base Point and Stony Island (names given by *Challenger* to these two places), up and over Itilialuk neck and down into Challenger Cove; then straight on up Port Manvers Run. Both 'rattles' were open water, the tidal stream being too strong to allow ice to form, and these were skirted by going over the necks of land. Going down the further side of the second neck a slight mishap occurred to the team on the big komatik, the bridle being cut among some tree stumps leaving the whole team to go careering off along the trail; Buck stood up on the komatik and let out a loud 'view holloa' which was heard by Henry ahead on the trail and he ran to stop the runaway team and bring them back. Tikkeratsuk, the goal for the first day, was not reached until about 8 p.m., 35 miles having been covered in 10 hours; for the last hour the party travelled by moonlight. The travellers put up for the night in a lonely shack belonging to an Eskimo called Ama Panagonjak, whose


To Kiglerpoit Mountains
Cascade
Tikkeratsuk
Man o'War Brook
Challenger Pt.
Sea Miles
10 5 0 1 2 3 4
PORT MANVERS
Rattle
Eddy Cliff
3007 Mt. Thoresby
Rattle
MAINLAND OF LABRADOR
Anchor Pt.
Approach Pt.
PORT MANVERS RUN
KAUMAJET
Mist Hill 1759
Double Is.
Quest I.
Kolotulik Bay
Kolotulik Hill 1022
Igloo I.
Big Black I.
Black I.
Webbs Bay
Cleat Pt.
Lopearl
Challenger Knoll
Amerak 1089
Sandy I
Tikkiraluk 1393
Webbs Pt.
Challenger Cove
Itilialuk
Moskie I
Stony I.
First Rattle
Mary I
Central I
Sakotalik 1088
Club I.
Base
Sabosookkuluk
Camp Hill
Kruger Kop
Harmony Run
Loon I
Noazunáluk
Rhode's I.
Hillsbury I.
Uigomigak
FIRST PART OF SLEDGE JOURNEY TO HEBRON
Northern Pt.
STRATHCONA RUN
MAINLAND OF LABRADOR
NAIN
Nain Bay
Southern Pt.
Nuvutannak
PAUL I

Survey area northwards from Nain, showing first part of sledge journey to Hebron hospitality included a seal for the dogs. And here the story is continued from Baker's diary.

> While supper was being got ready Ama went out and with the help of Nathan (Gillingham's driver) and Lucas (Smith's driver) cut up a whole seal for the teams to feed off. It was a grand sight, as it was brilliant moonlight, and they had hauled the seal out onto the sea ice, and were cutting it up there. Grouped round the seal in a semi-circle were all the teams, about 40 dogs in all. Henry and I were either side of the cutters keeping the dogs at a distance with our whips and Doc and Gillingham were among the dogs. The interesting part was to see how the teams grouped themselves, Henry's was opposite him and mine and Dennis' teams sat opposite me, while Doc's and Gillingham's teams respectively sat down by their masters' sides. Smith's team, not having their master there, sat on the extreme right of my team. . . . As soon as the seal was cut up into small bits one of the Eskimos gave the word and the whole crowd avalanched onto the food and there was surprisingly little fighting for so many dogs feeding.

The next morning the party had to back-track about four miles to the mouth of the Man o' War brook and then they started the long trek up and over the Kiglerpaits, a rugged range barring the way. The trail led upwards over the brook and a number of small lakes, all of course frozen over, with occasional steep climbs up small hills and down the other side. The snow was soft and the going poor and Baker's large, heavily-loaded komatik made progress very slow. The teams would have to be reorganised if they were to reach the Kurukuluk shack by nightfall, this being the goal for the day. Dennis' small komatik was left behind now, his team being harnessed with Buck's while Smith and Gillingham each lent two dogs from their teams, giving Buck 14 dogs on the big komatik with Dennis while Doc went with Stevenson and Henry on the other komatik.

At last the top of the pass over the Kiglerpaits was reached, but the descent on the northern side was almost worse than the climb; the snow was very soft and the big komatik kept taking charge and overtaking the dogs. On one occasion when the dogs were going all out, they went one side of a boulder while the komatik tried to go the other, the result being that the komatik rolled right over, throwing its riders, and then onto its runners again; without a stop Buck and Dennis were on the komatik again as it careered madly onwards. There were a number of sudden drops of ten feet or more which the dogs saw only at the last moment and it was with great difficulty that the komatik could be swung clear to one side or the other where the slope was more gentle.

Eventually the head of the Kurukuluk brook was reached and the teams started working down towards the shack at the foot. But the snow here was very soft indeed, a condition known as 'mowya', and from here, time and time again, the big komatik slid off to one side or other of the trail into the deep soft snow, and Buck and Dennis had to leap off into snow waist deep, and sometimes chest deep, in order to get the komatik back on to the trail. Their language should have been sufficient to melt the snow, and the dogs howled dismally until they could go on once more. In this manner the shack was eventually reached, making the second stage of the journey 25 miles. The shack was a rough old place without so much as a nail to hang the harness on to keep it away from the dogs, but it had a stove and a roaring fire had been got going before the last komatik got in.

Overtired from the terrific exertions of the day's journey no one slept much and Gillingham kept the fire going all night. At 5 a.m. the travellers had breakfast and by 6.30 the teams were skimming across the flat sea ice, from time to time passing over a neck of land, reaching Udlik Point, where there was a small Eskimo house, by 9.30, and here the teams paused for a 'mug up' of cocoa. Then on across another neck of land to Nutak Run where the going was very good; Nutak was reached by 12.30, an excellent run of 24 miles' really good going.

Nutak is purely an H.B.C. post with no settler or Eskimo dwellings in the vicinity; it is a clean and neat little place and here the Smiths made the party really welcome. Stevenson was sick with a severe chill so he was left with the Smiths at Nutak. As Henry did not know the trail northwards from Nutak, Smith urged Buck to take Willie Metcalfe, his Eskimo store servant, with him as guide and interpreter. The large komatik was left here and a smaller, old one of Smith's was taken instead. And so the party pressed on next day: Buck, Doc, Dennis, Henry and Willie Metcalfe, with two smallish komatiks and 16 dogs. At first the teams made for the small Eskimo settlement on Parkivik Point, and then, after some miles of rough going among the 'billycaters' along the shoreline, a high neck of land had to be surmounted, the snow being very ‘mowya’ and much time being wasted; it was dark by the time the sea ice was reached on the further side of the neck and it was difficult to pick out a trail. There was an Eskimo encampment close by somewhere but Willie was not quite certain where it was; then, after going a mile or so Dennis suddenly saw the lights of the houses behind and the teams were turned round. They soon smelt the place and away they went, hell for leather, arriving at the huts to the complete surprise of the Eskimos. Willie Tuglavina and Ephraim, living here with their families, took the party in and made them very welcome, everyone enjoying a really good night’s rest. This encampment, for this is all it was, consisting of huts of a very temporary nature, was called Itibliasuk and was 35 miles from Nutak. It huddled under the steep slopes of the Mugford Range of mountains, great square blocks of rock 3000 feet high, with sheer cliffs falling 2000 feet from the summits and then coming down to the sea ice in long scree slopes, a barren and forbidding landscape. During the early part of the next day’s run the mountains lay to the westward and the going was good along the sea ice and over the many low necks of land separating one bay from another. About 10 o’clock the party was joined by an Eskimo when they stopped for a ‘mug up’; he was hauling wood to Hebron. Willie Metcalfe said he was one of the bad men of Hebron, but he was a cheerful soul and could handle a primus like a good one and as it is best not to make an enemy of such a man in those parts, he came on with the party.

At half-past three in the afternoon the komatiks came in across Hebron Bay and *Challenger* would have been proud of her men if she could have seen them racing across the sea ice, with their white ensigns flying from each komatik. The Eskimos of the Hebron Settlement had never seen such a sight and, as they watched the arrival, there was much discussion as to who they were and what they had come for, but suspicions were aroused and soon there were few to be seen except Massie, the Hudson Bay trader.

Hebron consists of a few huts clustered around a great barn of a place which is the Hudson Bay store, right next to which is the church, denoted by a tiny cupola on the ridge of the roof. Despite the church it seemed to the travellers a God-forsaken place, but it was the journey’s end.

Massie had a meal all ready for them and it seemed that they were expected, which was strange in the circumstances, but after they had eaten they realised that Massie was as surprised as anyone in Hebron to see them arrive and he had given them his Sunday dinner.

Buck inspected the store on the following day and was shown where a small Eskimo had broken in through a window to allow the others to enter on the first occasion in November; on two subsequent occasions the rascals had entered the store by using a key they had cut for the purpose. Renatus was said by Massie to be the ringleader and Buck announced that he would interview all the Eskimos, one by one, on the following afternoon. This lasted from 4 o'clock until 8 o'clock and each man incriminated Renatus as being the leader in their misdoings. Then at last it was Renatus' turn to be interviewed and he at once started by being truculent. He had been threatened so many times before and nothing had happened that he thought he was above the law. This belief was strengthened by his faith in an old medal a schooner skipper had given him and which he regarded as a talisman, making him invulnerable to anything the forces of law and order might do to him. These forces found great difficulty in extending their long arm quite as far as Hebron and Renatus felt secure.

Baker thought he had better make his own position clear to Renatus. He asked: 'Do you know of God?' Renatus replied that he did. 'Do you know of King George?' Renatus answered that he had seen his picture and knew of his power. 'Well,' said Baker, 'I come next after him.' For the first time this thick-set Eskimo looked impressed, his jaw dropped and his attitude at once became more reasonable. And when Baker said he was willing if necessary to lash him to his komatik and take him to Nain, Renatus reluctantly agreed to be ready to travel with his family on Wednesday morning, anything in the way of clothing and gear which he would need for the journey being provided by the H.B.C. store.

Towards the end of the evening meal a deputation of the Eskimos arrived and said they wanted to see Baker. When he saw them they said they were all very sorry for what they had done and asked for orders for their future conduct. Buck told them to lead the normal life of the north, to go hunting and to trade their furs and not to spend their days lolling round the store hoping for pickings. One man said that he came on behalf of Renatus to say that he heard he was to be imprisoned in Nain, and if that was the case he would rather be killed now. Baker said that when he got to Nain he would certainly not be put in jail but would jolly well have to go hunting for his living and work for the survey party.

Most of Tuesday was spent by Renatus in going to the store, where the party were living, with various objections to his travelling south. But it was clearly put to him that he was coming south whether his family was ready or not, and so on Wednesday morning the journey began, Renatus travelling with his family on his own komatik. Good time was made to Itibliasuk where once again the hospitality of Willie Tuglavina was very welcome, there being quite a crowd sleeping in his hut that night; there were Buck, Dennis and Bingham, Willie Tuglavina and his wife and two tubby boys, the old mother and Job Allack, an Eskimo who had decided to travel south from Hebron with the party. When the travellers arrived there was a seal in front of the fire, thawing out preparatory to skinning, and after supper Job skinned it, removed the blubber, and fed the teams.

It was blowing like hell on Thursday and the party lay up all day in the overcrowded hut, sleeping or cursing the weather; but on Friday they were on the trail again, reaching Nutak that evening, where a day was spent waiting for Stevenson to be fit enough to travel.

Renatus was proving very friendly and amenable and for many hours at a time Buck travelled with Renatus on his komatik. The shack at the foot of the Kurukuluk Brook was reached early on Sunday afternoon and after a brief 'mug-up' in the hut, the ascent of the Kiglerpaits began again, the snow being very 'mowya' up the brook. To get through this heavy going one of the party had to break trail with snowshoes ahead of the dogs. At dusk the highest point of the pass was reached and here a camp was made, using the tents, while Renatus made a snow house for his family and Dennis. It was a fine clear night, the loveliness of which was accentuated by beautiful aurora with a delicate pink shade on the edge of the usual yellow bands of light; the night was quiet, crisp and still, as the travellers listened for the crackling sound that can sometimes be heard when an aurora is seen from high ground. But not a sound ruffled the immense stillness.

On Monday the last and best day's sledging of the trip was accomplished. Striking camp by 8 o'clock the descent down the Kiglerpaits began, and after a 'mug-up' in an old ruined shack at 3 o'clock in the afternoon, the teams reached the Base Camp at Nain at half-past seven, having covered 43 miles in a day and completed the round trip of 300 miles to Hebron in nine travelling days.

V

Spring in the North

MUCH surveying time had been wasted during the run to Hebron, so Baker was anxious to establish the next survey camp as soon as possible. Renatus, who was under open arrest, had settled down peacefully enough in Nain and was given employment by the surveyors when he was not hunting; he was particularly good at making snow houses and from now on the camps became more comfortable. But life was still hard and the entries in Lieutenant Commander Baker's diary for 25th to 28th February are typical of the conditions.

> Sunday, 25th February. Had a most disturbed night. We turned in about 2130 and I had been asleep about an hour when I woke up suddenly feeling that something was wrong. My first thought was that the dogs had broken into the snow house next door and were getting at the seals there. Kwalik, Dennis' new dog, which is always tied up, had been giving tongue earlier on in the evening and I remarked that I thought there was some mischief afoot among the dogs, but Dennis and I listened and could not hear anything so thought all was O.K.
>
> Dennis was awake by this time and we sat up and listened and soon made out distinct noises of crunching. Cursing, we pulled on our boots and gloves and jammed our caps on and burst out of our snow house in a rage to find seven dogs having the time of their lives in Henry's snow house, chewing the seals. I armed myself with an ice spear handle and Dennis poked them out one by one, and accompanied by much lurid language on both our parts, I gave each dog a thundering good hammering. Got them all out as I thought and then we blocked up the holes and pulled the komatiks up and turned them over on top and packed an assortment of gear round and on it and went back and started to turn in. We hadn't been in more than a minute or two when we again heard sounds of scrunching and both of us pulled our wind proofs on this time as it had been a bit chilly before and dashed out again thinking the dogs had broken in again. Nothing had been disturbed and the dogs all seemed quiet so I got my torch and pulled away a komatik and looked in and found that we had locked Lively, Dennis' leader, in with the seals and he was having the time of his life. He got what the others got and we hauled the seals out and stored them in the spare tent. They did not get much off them as they were frozen as hard as rocks and were smooth. Turned in and brewed a mug of cocoa as we were both very hoarse and thirsty after all

our vocal and muscular efforts. It was midnight by this time and we spent a peaceful night only to wake up and find it blowing like hell and drifting hard, cutting down visibility to about 200 yards.

Blew hard all day. What a country!

Monday, 26th February. Another wasted day as it continued to blow like hell from the west and then veered to the north-west from which direction the drift was much worse. Dennis and I spent a lot of the forenoon repairing Henry's snow house and spent the afternoon reading.

Tuesday, 27th February. A more or less decent day for a change during which we managed to do a certain amount of work. Marlowe and I went up Noazunaluk and a pretty perilous ascent and descent it was too. I had to cut steps on the snow slope which was as hard and as slippery as ice and one false step and one would have careened over either side and had a vertical drop of about 400 feet. Observing was an infernally cold business and in consequence a long one, taking three and a half hours for a job that under ordinary conditions would only take about an hour. After every two or three angles we had to stop and dance about and fling our arms in order to warm our hands and feet. The main trouble is that one gets sweating hot running alongside the komatik and climbing up the hills to the different stations, and one's duffles and socks which are by this time damp, freeze in one's boots and until you can get going again your feet are encased in ice. Every evening when I take my boots off the duffles are frozen to the soles and take a lot of getting out, and there is usually hoar frost in my socks as well, to add to the gaiety of nations. Got back to camp about 1730 to find Henry had got back from Nain and brought back all the odds and ends sent for as well as a nice present in the shape of smoked trout from Mr. Grubb, a delicacy he knows I love.

Wednesday, 28th February. A peculiarly bloodstained day. It was blowing fairly hard with a lot of low drift, but as it was beginning to cloud up I thought the wind would probably drop, so we made a start. The trip out to Central Island was foul, so much snow drifting that we could hardly open our eyes. Having climbed the hill we were out of the drift and the wind seemed not too bad until Marlowe and I tried to erect the windbreak. It was all we could do to hold onto it and when we finally got it up, the guys parted, and they were made of brand new stuff too. I gave it up as hopeless and, as the wind had increased, went across to the island where Dennis was observing only to find that he had been more lucky. His little island was more or less sheltered by Aulatsevik and so he had managed to observe. I did a bit of coastlining and shot up a few marks but it was a far from pleasant job as we were working up wind and it got so bad that I eventually packed up at 1500 and returned to camp. I got the snow house cleared out and cut up the floor and re-levelled it and put down spruce branches as beds for Dennis and me, as I had had to send Henry to Black Island this morning with our sleeping bags and deerskins, they having got sopping wet through the snow melting under our bodies. He got back about 1900 and now we are most comfortable and the beds feel like feather ones with the spruce under us.

> A calamity occurred while we were both in the spare tent drying our clothes, some of the dogs breaking into the snow house and eating up all our smoked trout. In addition they removed my small camera which was in a sealskin case and chewed up half the case, but luckily did not damage the camera. I could forgive them this everlasting breaking into places to find something to eat if they were badly fed, but they are better fed than any dogs on the coast and, if I catch one of them at it, and I know the two ringleaders in all these peccadilloes, they will rue it for some time to come.

Good Friday fell on 30th March and, while members of the party were attending the Church service, the weather turned suddenly mild with heavy rain and soon there was much slush underfoot; by Sunday, when the band climbed to the church roof to give a concert, all the snow had gone from it. Spring was coming to Labrador. The snow storms still came in the following weeks, but the snow was soft and wet, making poor going for sledging; the komatiks proceeded slowly and the men waded knee deep beside them.

During the long winter months those who did little travelling spoke of the spring with delight as one would speak of the coming of spring during the dark months of an English winter, but to men like Willie and Joe Ford, who spent their lives hunting and trapping, the spring held no delusions and they said so. Willie Ford said he loathed the spring, the going was nearly always bad and one suffered from a blistered face and cracked lips due to the heat from the sun being reflected by the snow. Even when snow was absent there was water about a foot deep covering the ice, through which the dogs had to wade. Baker describes in his diary travelling in the spring snow: 'The speed of travel was the speed of the dogs . . . as the poor beasties were belly deep the whole time and they had to lift their feet out of each step as the snow was too cloggy for them to push through. Walking alongside was no joy, plod, plod, the whole time and nearly always knee-deep . . . I found it was 5 p.m. and we had taken 7 hours to do 10 miles.'

Doc stayed in Nain for the time being as the whole settlement were down with sore throats and a mild type of influenza, and he had a busy time going from house to house, visiting his patients. Falling rain and melting snow now prevented the building of snow houses and the tents again became the only shelter for the camp parties. Everything got wet, the sleeping bags, the deerskin rugs and all the clothes they wore. The edge of the sea ice came slowly nearer to the coast during April, and it was not uncommon to break through the ice when travelling along the heads of the coves where fresh-water streams were coming down. Occasionally a sharp frost during the night would improve conditions for a few hours, but a thin film of ice would form over the water lying on the sea ice and through this the dogs' feet would break at every step making them dance like cats on hot bricks and laming them for days to come. No, nobody who travelled felt well disposed towards the spring.

The seals were beginning to come up through the holes appearing in the sea ice, where they lay close to the openings. The dogs had fared badly in recent weeks and whenever these seals were seen attempts were made to stalk and shoot them either from behind the 'billycaters' or by crawling out over the bare ice, clad in white and protected by a white vertical screen pushed ahead of the crawler. But time and time again the seals became alert and dived into the holes, and even when wounded they sometimes managed to slither in before the hunters running across the ice could get to them. Eventually, however, patience was rewarded and, on such occasions, the dogs fed well.

In early May it became necessary to lash a boat on top of each komatik and in this all the camp and surveying gear was stowed, so that in the event of breaking through or having to cross deep water lying on the sea ice, the komatik and the 'flat', as the boat was called, would keep afloat. It was a peculiar experience for the travellers to sit in the bows of a boat, the surrounding water being above the top of the komatik, while they looked ahead at the wading dogs towing this amphibian.

So with their faces covered in vaseline, their clothes sodden and their tempers frayed, the party worked on through the spring, more coastline being plotted, more topography being mapped as the outline picture of the coast grew and grew in readiness for the ship's return, when she would complete the work by sounding out the runs, the bays and the deep-water channels leading to the open sea.

On 22nd May the last survey camp of the winter was established, this time in a trapper's hut on Bridges Run. The brooks and the runs were opening up and every day detours to avoid open water became longer and longer and on Monday, 4th June, it was decided that komatik travel was no longer economical and the final return to Base Camp was ordered. Small paying off pennants, such as are hoisted by a ship at the end of a commission, were hoisted in the bows of the two flats, and the drivers beat frying pans to encourage the dogs. They left Bridges Run shack at 10 o'clock and the going was surprisingly good after an overnight frost, although the komatiks were afloat from time to time. Racing down the bay to Nain with the pennants flying and the pans beating, the two komatiks made a brave sight to the watchers in the settlement. The long sledging season was over, and the next few days were spent in disposing of the dogs to their original owners or those who wished to buy them.

At the end of June the ice was breaking up everywhere in the bays and in the runs. Every traveller coming in brought news of new cracks and openings in the sea ice. A message had been received that Bingham was required to go to England at the earliest possible date to join an expedition going to the Antarctic, and so Doc and Buck now turned their attention to this matter. The steamer *Kyle* would come north as far as Hopedale as soon as conditions made this possible but it would be necessary to have a boat to get south from Nain to Hopedale. Negotiations were commenced with one or two settlers who were known to have boats and finally it was agreed that John Voisey's would be in the water by the evening of 27th June, and that Buck and Bingham would set out in this boat with Waldo, another of the settlers, before high water on the following afternoon so that they would catch the tide going out through the runs.

At first a few floating pans of ice were met, but once clear of the Bridges Run the water was quite clear with fine weather. The boat party landed on Achpitok Island about half-past eight at night, lit a fire and cooked a meal, going on southwards an hour later. The boat was an open one with an engine, which, as in all other boats on the Labrador coast, was extremely temperamental, and the hull leaked. Not long after leaving Achpitok Island she broke down, and Waldo worked on the engine for an hour and a half while the water in the bilge slopped miserably from side to side as the boat lolled in the swell and Buck kept the hand pump going steadily. Eventually the boat got going again and passed through Shoal Tickle at midnight as the moon rose to light up the bleak landscape, and a cold northerly wind began to blow.

The boat party reached the H.B.C. post at Davis Inlet at 4.30 in the morning where they went ashore to shake Peters, the trader, no time being considered unusual for travellers to call in these parts, where each tiny settlement or hut is an oasis of warmth and comfort. Peters was away but the post servant's wife turned out, opened up the house and cooked them a good breakfast before they went on via Big Bay, Black Point, through Windy Tickle and on south to Hopedale, which they reached at 3.30 in the afternoon, completely worn out after 25 hours' travelling without sleep and with a bitter north wind blowing for most of the journey.

There was no news yet in the settlement of the arrival of the *Kyle* although the ice was clear and she was expected daily. The time of waiting was spent in trout fishing and in kayaking, and Buck had a kayak made for him to take north. The Labrador summer was beginning, the country was opening up, and visitors arriving. First came Macmillan, bound for Baffin Land to watch the birds nesting, then an American was landed from a schooner to spend the summer in a search for skulls and Eskimo remains, and then followed the *Fort Garry*, the Hudson Bay Company schooner, on her way north to collect the winter haul of furs. At last, on 9th July, came the *Kyle*. Bingham could embark for Newfoundland and Buck must head north again by boat.

Baker had left Dennis in Nain to carry on the work from the schooner *Mary Nolander*, loaned by Amos Voisey; she was twin masted, with an auxiliary engine. But Dennis had a tale of woe to tell when Buck got back to Nain; the engine would not go at all, mainly because one of the pistons did not even fit the cylinder, she sailed very badly as all the weight was aft and the sails themselves were rotten, and of course she leaked like a sieve. So now she was beached again, and while old Amos Fry, a settler, caulked the seams of the hull and pitched the bottom, Buck and Stevenson struggled to fit another engine, loaned by Mr. Grubb. But without cutting away large sections of the engine bedplate this could not be done so it was decided to rely upon sails alone. There were still a few important angles to be observed at the stations on the outer islands, and a number of stone cairns erected and fixed during the winter must be whitewashed in readiness for use as marks by the ship.

Without the assistance of many of the friends made during the winter the party might never have completed this last important part of the work. *Mary Nolander*, which became a floating and just mobile survey camp, would only sail in half a gale and relied upon tows given to her by various settlers who were going out to their fishing huts by motor boat. But these boats themselves were often in trouble, and it was a common sight to see the schooner under way being towed by two motor boats, only one of which ever seemed to be going at any one time, while the driver of the other was buried deep in her engine. Amos Voisey stood at the schooner's wheel looking, in his peaked nautical cap and heavy untrimmed moustache, like some whaling skipper of earlier days. Every day was a struggle, either sailing this cranky vessel or assisting some good Samaritan to extract quantities of sand from his carburettor so that he might help to tow the schooner. But the struggle was worth it and the last tasks of the winter party were eventually completed before *Challenger* arrived.

Challenger had meanwhile spent the lie-up in Portsmouth and sailed again for the Grenadines in mid-April, 1934. During the time at Portsmouth a number of officers and men who had been two years in the ship were relieved, but Commander Wyatt, knowing the Labrador coast, stayed on in command. Also during the lie-up one of the ship's sounding boats was fitted with an echo sounding machine—the first time *Challenger* carried such a boat; the days of hand lead sounding in boats were beginning to pass away. This innovation had far-reaching effects in the Surveying Service during the next few years: the daily output by boats was greatly increased, but so also was the amount of work to be done by the officers when they returned to the ship at nightfall and had to 'ink in' all the sounding work they had completed during the day.

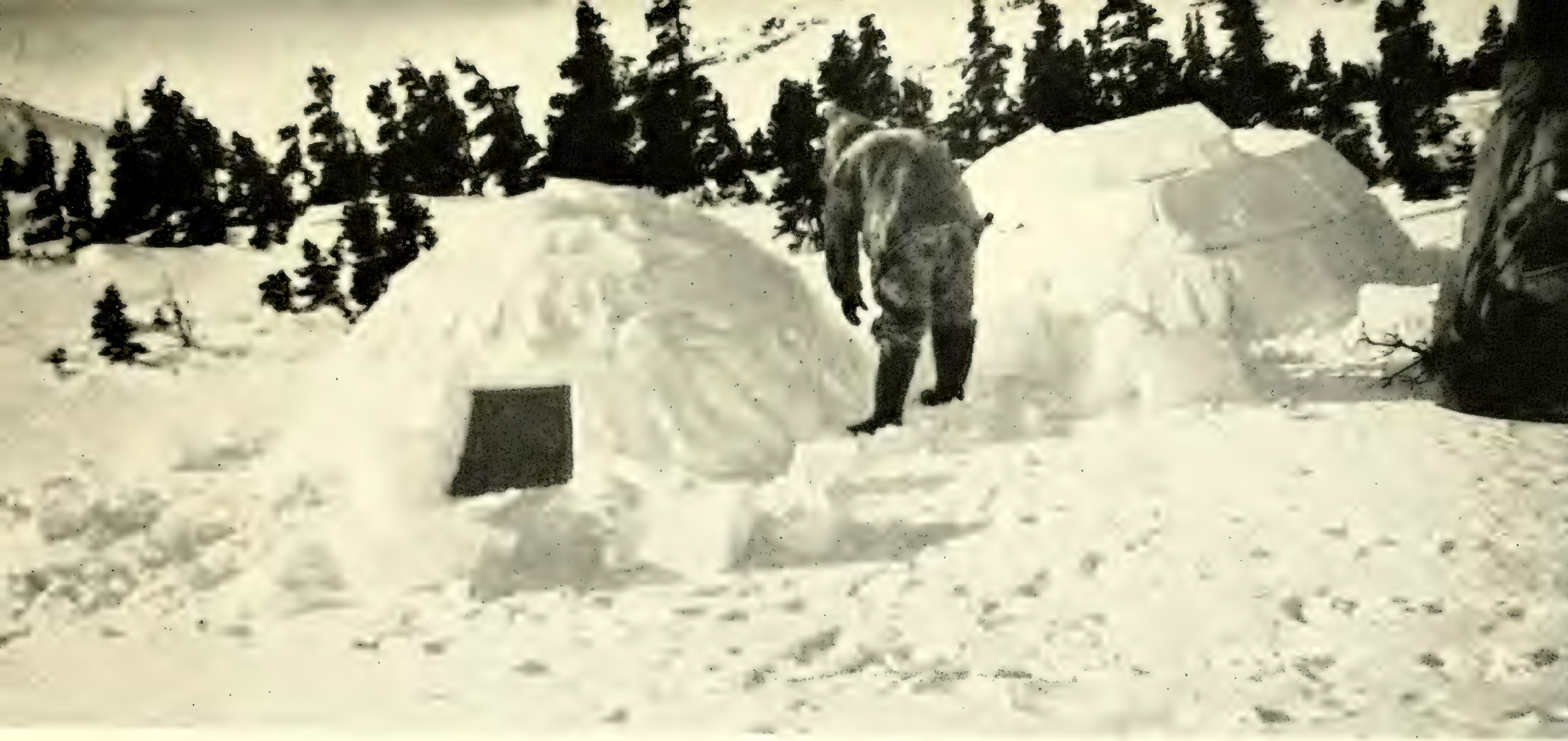
Economy had once again stepped into the life of *Challenger*. The Labrador survey was proving extremely expensive and during this winter was under discussion in the Admiralty. The expense did not seem to be justified in view of the few ships likely to visit the area in the foreseeable future, so it was reluctantly decided that the survey in the vicinity of Nain should be brought to a close during the coming season and only the possible shipping routes sounded. This, together with the soundings which had been taken during the ship's passages along the coast, were considered to be a very satisfactory addition to the hydrographic knowledge of the coast of Labrador. But it was also decided to survey the relatively important harbour of Cartwright before the end of the coming season. This decision to discontinue the Labrador Survey was not easily reached nor was it easily accepted by the authorities and others in Newfoundland and on the Labrador coast.

By early May the ship was anchored off the now familiar village of Hillsborough, Carriacou, in the Grenadines, and after a week-end there renewing old acquaintances she landed a camp party with both sounding boats on Little St. Vincent to carry on to the eastward the work commenced last year. The usual routine of coast marking and triangulation went forward and ship sounding began, the ship visiting St. George's, Grenada, for an occasional week-end's leave, and Trinidad to take on fuel.

In July the Grenadines survey was broken off and the ship headed once again for Labrador, calling at Halifax for fuel and reaching Nain on 23rd July. There was less ice on the coast than in former years and the passage north was comparatively simple.

Buck and Dennis were at their supper on this evening when someone rushed in and shouted something unintelligible which, on investigation, was found to be news that *Challenger* was rounding Nuvutannak, and she came to anchor at 7.15 p.m. off Nain. Buck and Dennis were out in their kayak waiting for her before she anchored, and alongside and onboard the moment she let go. There was a great reunion party, but there were many faces new to the two who had left *Challenger* nearly nine months before. It was 1 o'clock in the morning when the kayak left for the shore.

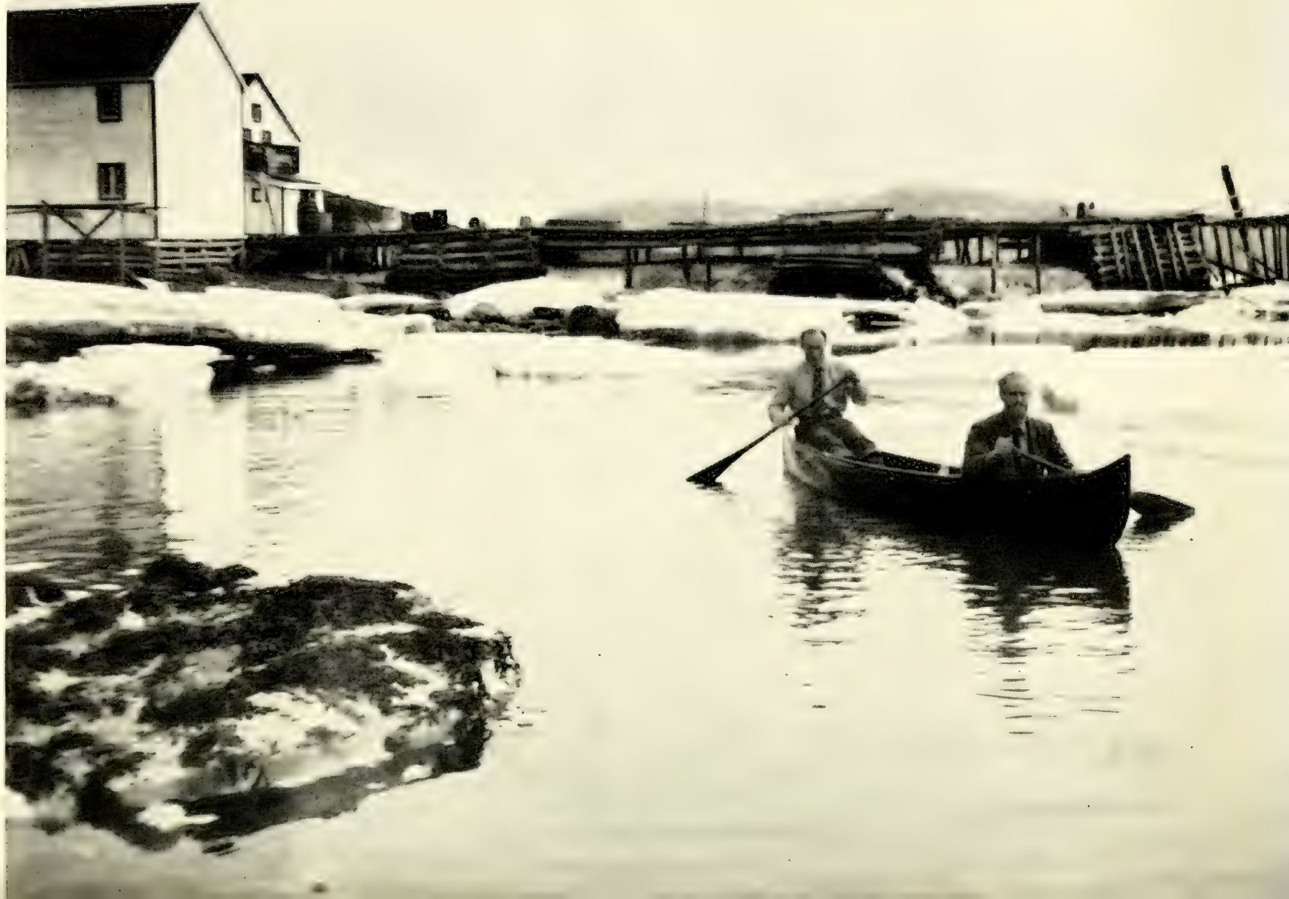
About three weeks later the *Kyle* arrived at Nain bringing with her two large policemen to arrest Renatus. They came to see Baker in *Challenger* and asked where his prisoner was confined. To their amazement Buck pointed to a figure peacefully chopping wood on the shore. They soon had him under arrest, for Renatus had given Baker his word that he would give no trouble, and under lock and key in the *Kyle*. Buck followed a few hours later



RENATUS BUILDING SNOWHOUSES

A SURVEY
CAMP

SPRINGTIME
TRAVEL



BUCK BAKER AND
DENNIS DEANE
GOING OUT
FROM NAIN
TO MEET
CHALLENGER,
JULY 1934

to take passage to Newfoundland, for he was bound for home. The Nain Band came out in a boat and played farewell tunes as they circled the *Kyle*, finally tackling 'God Save the King' as she sailed away.

There was a Justice of the Peace onboard *Kyle* and the trial of Renatus was arranged. It was expected that Baker would prosecute, but to the surprise of the Court Baker elected to defend Renatus as he had no other onboard who could befriend him. Renatus' defence was that he had caused the disturbances at Hebron as he thought the Eskimos were being badly treated by the trader there and he wished to cause an investigation of these injustices. He was sentenced to two months' imprisonment and Buck and Renatus parted firm and lasting friends.

Challenger completed the survey by sounding out a good approach channel to Nain from seaward from the vicinity of the Hen and Chicken Islands and by sounding the coastal passages southward from Nain. She carried out a running survey through the Port Manvers Run, and sounded out a narrow route southwards from Port Manvers through the labyrinth of islands which had been mapped by the winter party outside Aulatsevik.

The latter part of the season was spent doing a survey of Cartwright Harbour and approaches, both boats being left in camp there to progress the work while the ship visited Quebec for fuel and stores, this being a pleasant change from Halifax which the ship's company now knew so well. On 15th November, with the survey of Cartwright complete, *Challenger* sailed away from Labrador for the last time, reaching Portsmouth on 24th November, 1934.

VI

The West Indies

In March, 1935, Lieutenant-Commander Alun Jones relieved Wyatt in command of *Challenger* and Wyatt went to the surveying ship *Flinders* and Deane accompanied him. Jones, a Welshman, was well known in surveying circles for his energy and great output of work, and there was certainly plenty to be done in the next two years in the West Indies.

The Labrador surveys being finished, the whole of the 1935 season was to be spent in the West Indies. The anchorages in the Grenadines were not yet completed, so once again the ship anchored off Hillsborough, Carriacou, on 26th April, the remainder of the month being spent in getting the survey in hand and in establishing the necessary camps. There was still some sounding and topography to be completed at Carriacou, and a detached party was established on Tobago Cays to commence the surveys there. During June, both boats were working from the camp on Tobago Cays while the ship carried on steadily with the sounding in the deeper water.

Some of the hill marks had been left the previous year, and once these had been re-flagged they were used as sounding marks. However, considerable trouble was found in making the fixes 'go' —fixes on different sets of marks gave differing positions. It was after some searching and puzzling that the cause of this trouble was found and it was due to the good relations which had been established with the people of Hillsborough. In the ship's absence a hill fire had swept towards one of *Challenger*'s marks, which the villagers had rescued in time and replaced after the fire had passed by. It was only unfortunate that they had not replaced the mark exactly.

To build up the triangulation a theodolite is used. In practice, theodolite work is far from simple; the instrument must be exactly levelled and a very light touch is necessary, though this is sometimes hard to achieve when panting and sweating on a jungle hilltop after a hard climb. The elements also make observing difficult on many occasions, a heat haze causing the distant mark to dance about in the field of view of the telescope, while a high wind will shake the theodolite and throw it off level despite the erection of wind-breaks. It is always a satisfactory point in a survey when the theodolite observing has been completed, and the position of the marks relative to the origin having been worked out, they are plotted and ringed with convincing red circles on the plotting sheet. Even the plotting needs skill and speed, for in the tropics the paper on which the sheet is plotted may alter its shape from day to day, owing to the differing temperature and moisture of the air.

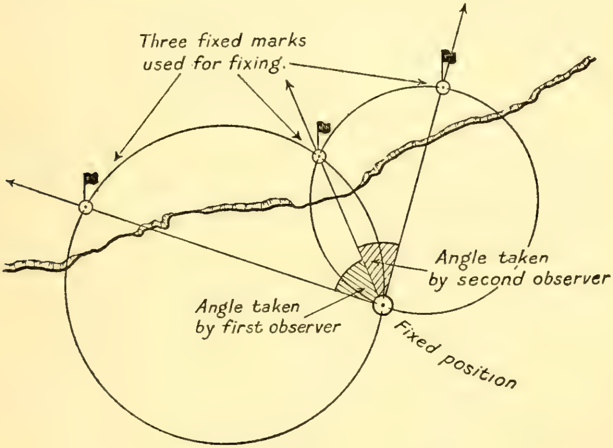
One day, Lieutenant R. H. Griffiths was away on Carriacou with a theodolite and was being hampered in his observations by a crowd of West Indian girls who were peering inquisitively into the object end of the theodolite telescope. They thought he was taking photographs of them and they were all anxious to be in the picture. Griffiths hit upon the idea of letting an intelligent-looking male bystander look through the theodolite telescope and then got him to explain to the crowd of women and girls that the officer could see them all 'upside down', as in fact the image seen through a theodolite is always inverted. There was immediate consternation, and all at once stood aside except for one large 'mammie' carrying a huge basket on her head who refused to move, and when upbraided by her fellows for her boldness and vulgarity, she said loudly, 'I don't mind; I'm not like you common women—I wear drawers.'

Once the copies of the various portions of the plotting sheet have been made by transferring the positions of the stations on to paper pasted on field-boards, the fieldwork itself begins. Fieldwork consists of ship and boat sounding and coastlining. During all these operations the location of details is done by the observer fixing his position by sextant and station pointers, the theory of the latter being as follows: If an observer takes a horizontal angle between two fixed points he knows that his position will lie somewhere along the circumference of a circle passing through these two points. If, at the same time, he observes the angle between one of these fixed points, and a third, then he knows that his position will lie at the point of intersection of the two circles, the diameters of which are determined from the angles which he has observed.

To fix the coastline the surveyor walks along the shoreline, stopping at each alteration of direction of the coast, when he fixes his position by observing the horizontal angles between three well-selected triangulation stations or secondary marks. He can then plot his position with a pair of station pointers, an instrument with three long metal arms, two of which can be moved either side of the central fixed arm to set on the angles observed by the sextant; and when the angles are set the station pointers can be moved on the field-board until the three arms pass through the three selected stations. The observer's position is then indicated by a small V cut at the centre of the station pointer. When a number of such fixes have been dotted, circled, and numbered in pencil, they can be joined up rather as children connect up numbered positions on a blank drawing featured in children's papers and find they have drawn an ostrich or a boy wheeling a barrow. The surveyor's less exciting picture will be the coastline.

It was a pleasant enough occupation to go for a day's coastlining on an island in the Grenadines. Accompanied by a surveying recorder companion, the surveyor walked the shoreline, the turning of each small point of land opening up fascinating new vistas—a yellow, sandy, palm-fringed beach; a rocky cove with sparkling blue water heaving towards the rocks; the long thin white line of breakers on the windward side of the pale green reef; a hutted village beneath the trees. From such huts came the smiling people to see what strange 'looking' and writing was going on as the surveyor sketched in his field book the details of the shore or the trees and huts behind. The children followed for a mile or so and felt well rewarded when allowed to peer through the telescope of the sextant, through which they probably saw nothing. A halt for a sandwich lunch in a cool palm grove, a bathe, and then on and on along the shore the coastliners went until the boat came in through the surf to collect them and take them back to the ship; onboard the weary pair would plot and ink in the day's work and feel, over an iced whisky or a tot of rum, that they had added some small contribution of their own to the vast whole of the world's maps.

Every day the ship and the boats were slowly covering the sea with lines of soundings. Backwards and forwards they went, first running in towards the shore, then to seaward again; the boats worked along the coast in the shallower water of less than ten fathoms or so, the ship carrying on the sounding to seaward of the boat's limits. The sextant and station pointer method of fixing is used in such cases but as the boats and the ship are moving an officer and a recorder take the two horizontal angles simultaneously at the word 'Fix', which is heard at frequent and regular intervals throughout every long day's sounding. The lines along which it is proposed to sound are drawn on the field-board, and by steering the appropriate course, and by making small alterations whenever a fix shows that the ship or boat is being set off the line, an endeavour is made to follow the planned lines which will give a regular sounding coverage of the area.



Theory of station pointer fixing

Ocean currents are caused by the friction of wind upon the surface of the sea, and the North-East and South-East Trade Winds set up westerly-moving currents north and south of the equator respectively. These great equatorial currents continue westwards until they meet the land, when they are deflected to the right in the northern hemisphere and to the left in the southern hemisphere, setting up great clockwise current movements in the North Atlantic and North Pacific, and anti-clockwise movements in the South Atlantic, South Pacific and Indian Ocean. These movements carry cold water along the eastern sides of the three great oceans towards the equator to take the place of the westward-flowing water, and this does much to account for the lack of coral growth in these regions, for the coral polyp does not endure in a temperature of less than 20°C.

The coral polyp, which must be regarded as a sea anemone which lives and multiplies by extracting lime from sea water, thrives therefore in the western parts of the great oceans, between the latitudes 30 North and 30 South, where the water is warm enough for its tastes.

The coral reefs, which are built up of the countless calcareous skeletons of coral polyps, will often build out more readily to windward of an island where abundant 'food' is brought by the water of the west-flowing current. Thus in the Grenadines great areas of reefs grow out to the eastward, leaving behind them bays and passages between themselves and the land; whereas on the western side of the islands there are practically no reefs.

The Trade Winds were blowing strongly on to the reef-fringed eastern side of the Grenadines in May and June, and no inshore work was possible in this area until the winds eased off about the middle of August. As soon as this happened, work on the western side of the islands was suspended, a camp was established at Little St. Vincent, and both the sounding boats concentrated on the weather side of the reefs during a spell of calmer weather.

So the survey went on, the Captain constantly thinking ahead and planning to make the most of changing weather conditions, his First Lieutenant putting his plans into practice, arranging for men to go into camp, for stores and fuel to be landed, while the Engineer Officer seized every opportunity to carry out maintenance work on his boats, which ceased running only for a few hours at the week-ends.

In June, the Captain was promoted in the Half-Yearly Promotions to Commander, and after the customary celebrations onboard he ordered a 'brass hat' from Gieves, the well-known naval tailor of London. It took two months, however, before this necessary item of uniform reached the ship in Grenada, and the Captain had been wearing it only a fortnight before it blew overboard in a sudden squall while the ship sailed from St. George's. For a further two months the Captain had to revert to his plain-peaked cap which he had worn as Lieutenant-Commander.

About ten days later the Captain was going ashore at Grenada when he saw a rascally native boatman wearing the missing 'brass hat', only a little green in places as a result of its immersion in sea water. This almost naked boatman proudly continued to wear the hat as he plied for hire round the ship during her subsequent visits to Grenada, he being the Commander while the Captain remained a 'two-and-a-half'.

There were other diversions to be fitted in with the minimum of delay to the general progress of the survey; His Excellency the Governor of the Windward Islands requested a passage from St. George's, Grenada, to Kingstown, St. Vincent, and this was carried out with the appropriate ceremony; the ship had to visit Trinidad for oil; the schooner *Jane Victoria* was stranded on a reef off the east coast of Carriacou and was refloated by *Challenger*; the ship's divers recovered 30 fathom of anchor cable lost by S.S. *Cornwallis* off St. George's; four days' summer leave was given to the crew, who billeted themselves in the Quarantine Station for the purpose. Her Majesty's Surveying Ships are, first and foremost, vessels of the Royal Navy, and as such expect from time to time to carry out duties more normal to General Service Ships.

On Monday, 14th October, the Governor of the Windward Islands was once again embarked, and while the boats' crews in camp at Tyrell Bay were completing the Grenadines survey, His Excellency visited in *Challenger* some of the smaller islands of the Windward Group. Finally he landed at Kingstown, St. Vincent, on 17th October, where he was to attend a Legislative Council meeting to put through certain changes in legislation.

Ever since the commencement of the Italian-Ethiopian dispute, feeling had been very tense among the peoples of the Windward

Group and Trinidad. A very great interest had been taken by the lower classes in this colonial war, which was seen as a racial conflict between Black and White. Employment conditions in the Islands were not good at this time and the working-class people were only too ready to listen to the street orators as they reviled the Whites for doing nothing to stop Mussolini murdering Africans. One orator had held up a white and a black fowl, and his audience became wildly excited when he struck the head from the white bird as a symbol of what would happen soon to all Whites who were standing aside in the African War.

The Governor's visit to St. Vincent was to introduce new tariffs which were not designed to hit the poorer classes but were to be a charge on the middle-men. Rumours of these new taxes circulating before the Legislative Council met, some of the store proprietors at once put up their prices; on some commodities such as matches they increased the price by 100 per cent, while the prices of salt-fish and other staple items of diet of the working classes were increased in varying amounts.

In their present unsettled mood the working-class people were thus bitter and hostile before His Excellency met the Council to discuss the tariffs. Whilst the meeting was taking place, murmurings were heard outside the Courthouse, and soon a petition was sent in, requesting His Excellency to give a personal interview to one of the leading members of the Representative Government Association which had been formed about three years previously, and which had gradually become highly critical of all Government actions. The Governor intimated that he would meet the petitioner at the conclusion of the Council meeting, but by now the murmurings outside had developed into an uproar, which the Governor then attempted to quell by going outside himself to face the crowds and address them in person. The crowd nearest about him began to calm down as he started to speak in a steady voice, but as noise on the outskirts of the crowd made it difficult for him to be heard, His Excellency suggested that a deputation from the crowd should enter the Courthouse with him to state their case. As soon as the Courthouse doors were opened the mob surged in, and it now became obvious that the great majority were well primed with rum and were quite unprepared to listen to reason.

The reading of the Riot Act by the Chief Justice had little effect, and the rioters, now armed with sticks and stones, divided their forces into three main bodies, more by chance than by organisation. One section went to the prison, broke down the gates and released some of the prisoners, severely manhandling one of the warders in the process. The second section cut the cables at the Cable Offices and the remainder of the rioters commenced looting the stores.

The police were by now armed and they fired a round over the heads of the looters. This had no effect and so orders were given to fire low at this section of the mob. Most of the casualties occurred at this stage, and the looters now began to filter up the side streets, taking their booty with them.

There was sporadic looting and uproar in the outskirts of the town throughout the day, when property was damaged and stones were thrown.

The wires leading from the Cable Office having been cut, no signal could be sent to the outside world from there. However, the A.D.C. to the Governor and a member of the Cable Company managed to find their way on foot through the skirmishing on the outskirts of the town and along the shore to the cable hut which was still intact, and were there able to pass a message to Grenada calling for assistance. They were just in time, as the mob cut the wires outside the hut only a few minutes after the signal had gone out.

Challenger was carrying out a survey of the harbour at St. George's, Grenada, being anchored in the harbour, with her boats and parties away from the ship on the survey. To her came the message from Kingstown. The general boats' recall signal was hoisted at the yardarm and the various parties of officers and men hurried back to the ship. Such a recall is unusual during the course of a fine surveying day, and speculation as to its meaning was intense among the boats' crews as they collected the coastline parties and made for the ship. Theories ranged from a major error having been found in the triangulation to an order having been received onboard to return at once to Portsmouth. One lovelorn ordinary seaman was already imagining himself meeting his girl on Farewell Jetty at Pompey when he was rudely awakened to the fact that he should be handling his boat-hook as the boat came alongside.

The ship sailed as soon as all boats were hoisted and a number of Grenada police had been embarked. Steaming at her best speed she came into Kingstown in the dark and anchored off the town by midnight.

A United States newspaper report of this rush to St. Vincent caused amusement onboard when the papers were received: 'The battle cruiser Challenger, travelling at high speed, rushed to the Island, with the Marines formed up on the quarterdeck with bayonets fixed, ready for landing, and the guns manned and trained in readiness for action.' *Challenger*'s maximum speed at this time was about ten knots, while her armament consisted of 12 rifles, 6 revolvers and 6 cutlasses.

The Navy does not exist to do police duties ashore, and on occasions such as this when it is called upon to aid the Civil Power, it is loathe to take action unless it is clear that the situation is beyond the control of the local police. The Navy's strength is more often in the sobering effect which the presence of a well-disciplined force always has upon an excited population. The Senior Naval Officer must discuss the situation with the local authorities and decide the most suitable rôle for the Navy to play. And so at about 1 o'clock in the morning, Commander Alun Jones was reporting *Challenger*'s arrival to His Excellency the Governor, who was conducting operations from the Police Headquarters. It was decided that the men of *Challenger* would relieve the police of guard duties, enabling more police to take action against the rioters. *Challenger* took over responsibility for guarding the Police Barracks, the Power Station, the Cable Offices and the Telephone Exchange, and parties of officers and men from the ship who had been quietly preparing onboard were soon marching through the dark streets on their way to take up their stations. One party came face to face with a priest who was levelling an old blunderbuss at them; he had thought the tramp of feet indicated the approach of a well-organised section of the mob coming to loot the treasures of his church.

A wireless signal station was established in the Police Headquarters which kept in touch with *Challenger* throughout the week, while the ship's Medical Officer was kept busy assisting with the casualties in the hospital. But perhaps *Challenger*'s greatest part in the quelling of the riots was the steadying effect brought about by the ship's company being granted leave in the evenings and their playing of football and cricket, at first among themselves and later against local teams. This was by no means the first occasion on which the Navy has employed football and cricket to restore a sense of normality to an excited populace.

The local police, aided by the Grenada police who had arrived in *Challenger*, were now able to turn their full attention to the rioters in the outlying country districts. Within a very few days all was quiet again and the shopkeepers were taking down the boards from their shop fronts and glass and litter were being removed from the streets. Life became normal again in Kingstown.

Soon after *Challenger*'s arrival the Chief of Police had cracked up under very considerable strain and the Captain was asked to relieve him temporarily. This meant all-night duty at the Police Headquarters.

About 6.30 a.m., a policeman brought in a person accused of looting. The night had been a busy one at the H.Q. and the situation in the town at the time was very tense. The prisoner was one of the aboriginals of St. Vincent, people who live in the dense jungle in the highland interior of the island. They speak no English and never wear clothes; they seldom visit civilisation; but they had heard vaguely of the riots and a few of them had ventured into the towns hoping desperately for food, and this aboriginal indicated by signs that it was food he had in the parcel he was carrying. The bundle was ordered to be opened in front of Commander Alun Jones, and a lady's pink boned corset was all that it contained—little use as food or clothing for this miserable, naked man, who stood trembling before his captors.

Six days after arriving at Kingstown, at 3 o'clock in the morning, *Challenger* crept away like a white ghost, and by 10 a.m. the surveying boats were being lowered in Grenada Harbour. A day or so later, Commander Alun Jones received a letter from His Excellency the Governor of the Windward Islands thanking *Challenger* for her valuable assistance to the Administration in its efforts to restore law and order, and expressing his sincere appreciation of the good conduct and discipline of her ship's company and the friendly relations with the people of Grenada and the Grenadines which had existed throughout her numerous visits.

Challenger again acted as policeman at the St. Lucia coal strike a month or so later, and then went to Trinidad for oil fuel prior to returning to England. At the last minute a survey was ordered in Dominica, off a small village called Portsmouth at the north-westward end of the island. Commander Alun Jones enjoyed sending his final departure signal to the Commander-in-Chief West Indies Station—'*Challenger* left Portsmouth for Portsmouth,' it read. But no word came from the C.-in-C. to indicate whether he appreciated the coincidence or put it down to a signalman's error.

Outward bound again after the lie-up in May, 1936, the usual water sampling and temperature observations were carried out in the Atlantic. The programme of surveys for this season was an extensive one in the vicinity of Trinidad. The island of Trinidad lies to the eastward of the coast of Venezuela, enclosing by two long arms running to the west a great shallow area between the island and the mainland. This is the Gulf of Paria, where the depths of water vary from 8 to 15 fathoms and below which a number of oil companies were at this time prospecting with a view to drilling beneath the sea for oil.

Challenger still had on the bridge the type of echo sounding machine with which the operator listens for the returning echo. The shallow floor of the Gulf of Paria is composed of soft, grey mud, which made the returning echo impossible to hear. However, the new boat's set which had now been fitted recorded the soundings on iodised paper in a similar manner to the deep water set carried in the ship. In the boat set the small returning echo was amplified on receipt from the sea-bed before the paper was marked. So it was decided that the new boat's set must be installed in the ship to get the best results when ship sounding over this soft, shallow bottom. The transmitter and the receiver of this set, which can be imagined as the speaker and receiver of a telephone, are fitted inside the hull of the boat in tanks which are filled with fresh water. When the set was moved into the ship these tanks posed a problem, until Lieutenant Menzies, the Navigating Officer, thought of using upturned buckets welded to the ship's hull which housed the transmitter and receiver excellently.

This echo set worked well and the survey went on apace.

Frequent samples of the bottom were taken with special scoops, such samples being much in demand by the oil prospectors.

As the days passed, the ship required more and more propeller revolutions to push her along at the speed necessary to carry out the sounding work; it was seen that a thick growth of barnacles clustered along the water-line. The ship's divers went down to find the whole hull thickly covered with barnacle growth, choking the inlets through which water is taken into the ship to condense the used steam, and to circulate around the cooling plant.

Serious boiler defects occurred about this time, first in one boiler and the following day in the other. An inspection showed that it would be dangerous in the extreme to continue steaming. Bermuda was the nearest Naval Base, and arrangements had to be made to tow the ship there for the fitting of new furnaces, which would be a lengthy business. An oiler of the Royal Fleet Auxiliary, the *Celerol*, eventually came to Port of Spain and commenced this long tow of nearly 2000 miles. Things went well during the tow, the speed getting gradually faster and faster despite signals from *Challenger* calling for speed to be reduced. The passage took just over a week, the two ships arriving at Bermuda on 10th November. It was rumoured there that the Captain of *Celerol* had been sick for the latter part of the tow and that the First Officer, who had taken over, had a girl friend in Bermuda who was thus responsible for the very great despatch with which the stricken *Challenger* was hauled to her destination.

The ship was docked on arrival so that the full extent of the growth on the hull could be seen. It was completely composed of shell growth, there being no trace of weed of any kind.

Here at Bermuda *Challenger* lay, immobile herself until new furnaces arrived from England, which was not until 31st May, 1937. But although the ship may have been idle, her officers and men were far from being inactive. There is always surveying to be done and here was no exception. The hydrographic surveyor is ready to improvise and to take on local craft to expedite his labours. Camp parties were established about the Bermuda group of islands and with the aid of local boats which had been pressed into service to augment the work of the ship's boats, a great area of Bermuda, including the main entrance through the reef and the harbour at St. George's, was surveyed.

On 20th July, 1937, *Challenger* sailed from Bermuda for Portsmouth, Commander Baker having returned to the ship to take over command from Jones. She re-commissioned in Portsmouth and returned to Trinidad to complete the surveys in that area. This work in the Gulf of Paria was finished by February, 1938, the ship having spent Christmas alongside the new wharf being constructed at Port of Spain.

Surveys at Barbados were left to detached parties, while two deep-sea sounding cruises were carried out and a visit made to Bermuda for a quick docking to remove the barnacle growth that had once more accumulated on the ship's hull during her period of working in the Gulf of Paria.

The Leeward and Windward Islands form a crescent from Puerto Rico to Trinidad through which merchant ships use well-known passages; and one of the most popular of these is the Sombrero Channel east of the Virgin Islands and lying almost on the direct route from England to the Panama Canal. A small, low, dun coloured isle known as Sombrero Island lies in the north-eastern approach to this channel, and a light upon it, maintained by dues paid by British shipping companies, shows the way through the island chain. To fix accurately this focal point is of considerable importance, and *Challenger*'s last task in the West Indies was to land an astrolabe observing party on this island to take star sights to locate its accurate geographical position.

When *Challenger* sailed from Sombrero for Portsmouth, she left a part of the world of which her officers and men had many happy memories of bathing picnics, sundrenched beaches, cool rum drinks, and cheery parties with the many friends they had made there. Life was good in the West Indies in the days before the war. It was to be 12 years before *Challenger* returned to the Caribbean where she had spent so much of her early life.

VII

Sandy Shores

The lie-up was completed by mid-October and the fair sheets drawn and forwarded. These are the detailed and very minutely drawn charts prepared by hand during the lie-up period and carefully stored in the Admiralty for the use of future generations of surveyors.

It is from such sheets that the cartographers in the Hydrographic Department of the Admiralty compile Admiralty Charts. The cartographer is unable to use all the soundings shown by the surveyor so he must select with care those soundings which, when shown on the published chart, will best indicate to the navigator the trend of the sea-bed, the shallows and the deeps. Nor must he include too many soundings or the mariner will be unable to see the wood for the trees—the cartographer must leave the sounding pattern open so that the navigator can plot his courses clearly and insert his pencilled fixes.

A full-stop is thus inserted at the end of the season's work and the Hydrographic Instructions are studied so that the surveys for the forthcoming season may be planned.

Challenger was now bound for the coast of Arabia, where the winter months are more temperate than the shimmering summer and thus generally more suitable for survey work. On 18th October, 1938, she was heading down channel on one of those grey, drizzling winter days with the visibility down to a mile or so; through this misty curtain appeared from time to time a destroyer at sea on exercises, or an Atlantic liner inward bound for Southampton, her passengers eagerly peering for their first sight of the Isle of Wight.

Challenger followed the familiar run to the East so well known to the naval man; to Gibraltar with its first feel of a foreign land and yet still so English with its army garrison and familiar police uniforms; the sun on the water; the smell of horses at the gharry stands; the oranges for sale in net bags made of some form of vine which have the habit of bursting and casting their contents upon the waters as the sailor, who may have had just one too many, gropes his way from the liberty boat on to the gangway; and the female orchestras beating out the popular dance tunes of the day which are a feature of naval night life at Gibraltar. Then on to Malta's Grand Harbour where *Challenger* was dwarfed by the grey giants of the Mediterranean Fleet as she came in to berth below the golden-yellow bastions of Fort St. Angelo; the steep climb through the narrow, stepped streets which were thronged in those days not only with people but with goats, to Strada Streta where a sailor could lose himself in any one of the hundred bars which existed only for his particular entertainment, the very names inviting his patronage—the Light Cruisers Bar, the Dreadnought, the Royal Marine. On across the sunlight waters of the Mediterranean until the High Light at Port Said was sighted above the low landscape of yellow and white blocks of flats along the seafront; in past the long breakwater which is yearly being thrust further and further to seaward in an endless struggle to arrest the drift of the sediments carried eastward from the Nile Delta, and which constantly threaten to close the entrance to the Suez Canal; past the fishermen's boats moored to the quayside, their nets hanging to dry on the tall iron railings of the port area whence carries to the passing ship the overwhelming smell of fish.

After a night at Port Said *Challenger* moved into the canal with a French pilot on the bridge. All that sunlit day she sailed steadily southward, the pilot yarning with the Captain, giving him the latest news of the canal, the changes in administration, the difficulties of a recent passage with an unwieldy ship, life in Egypt since the 1936 Treaty and above all now, in 1938, the threat of war and its effect upon the vital link of the Suez Canal. Quietly the orders were passed to the helmsman as each change of course carried the ship south past Ismailia, that oasis with the green lawns of the French Club running down to the canal bank like sward beside an English river; past the neat yellow signal stations surrounded by their green belts of trees, where numbered boards, cones and flags hoisted on the masts gave the pilot news of other shipping moving in the canal; past Deversoir station into the Bitter Lakes, their glassy surfaces stretching away to meet the

MAIN STREET, HILLSBOROUGH, CARRIACOU, GRENADINES

THE SURVEYOR'S
TOPOGRAPHIC
TASK IN THE
GRENADINES

sandy shores of the Sinai Desert; past gangs of Egyptian workers reinforcing the canal banks, who paused in their labours to shout ribaldries at the British sailors. Finally after dark the ship was out in the Bay of Suez, the pilot was saying good-bye and *Challenger* sailed into what was, for her, a new world—a world of blue seas and brown shores, of sandy hills stretching upward and away to a distant horizon; these hills have shape and form when the long shadows of the morning are upon them but lie dun coloured and featureless in the midday heat; a land where yellow land-tint replaces green on the fair chart.

Masira Island, composed of a number of bare, stony brown hills, is about 30 miles long and three or four miles wide, and lies some 8 to 10 miles off the coast of Oman in south-east Arabia, parallel to the mainland. Between Masira and the coast is an area of reef-studded water where it was hoped to find a channel leading to a sheltered anchorage, which could be used when operations were put in hand to build an airstrip and air station on the island. This station was to act as a staging post on flights to the East, and is now one of the loneliest postings an R.A.F. officer or man can be offered.

In 1938 there was only the Arab population on Masira, living in a few villages along the western shore and ruled by the Sheikh, Khamis bin Hilal, who owed a distant and vague allegiance to the Sultan of Muscat, with whom Great Britain has had a treaty of protection for many years. So, before commencing the survey of the Masira Channel, *Challenger* proceeded north to Muscat to embark the Political Agent, Major Watts, so that he might be taken to Masira to explain the proposed work to the Sheikh and people of Masira. The Arab of the desert is suspicious, and surveying vessels in the past have become embroiled in misunderstandings with Arabs on remote shores, who have thought that the flags erected on the triangulation stations bore political significance.

The town of Muscat lies in a semi-circular bay surrounded by rugged and barren mountains. The glaring white houses are disposed around the bay like seats in the stalls of a theatre; flanking the stage are two old Portuguese forts dominating the blue sheltered water—the stage where the ship is anchored.

As it was impossible to locate the Sheikh after anchoring off Masira the Captain and the Political Agent made contact with the Headman of Dawa, and it was explained to him that the survey marks must be left where they were placed until the ship recovered them. The islanders were friendly from the beginning and the ship's medical officer, Surgeon Lieutenant Sloan Miller, seeing their rheumy eyes, running sores and bad teeth, suggested to Commander Baker that he might set up a camp near the village where he could dispense medical treatment to those villagers who were in need of it; at the same time this would further friendly relations between the ship and the local people. This relationship is greatly needed in countries where both wood and cloth are scarce, as survey marks constructed of these materials become a source of great temptation.

Whenever the Captain made enquiries for Sheikh Khamis bin Hilal he had either 'gone to Oman' or was 'away fishing'; however, Miller, with the aid of his interpreter, Hassan Ramzam, gained the confidence of the 400 or so inhabitants of Dawa to an amazing degree, being hailed as 'Hakim' by all, and one day the Sheikh, hearing of the medical camp, arrived there to visit Miller.

Arrangements were made for the Sheikh to return to the camp with his brother and the Head Man of Dawa on the following Thursday. The Captain would be there to meet them and all would then go onboard *Challenger* for a social visit.

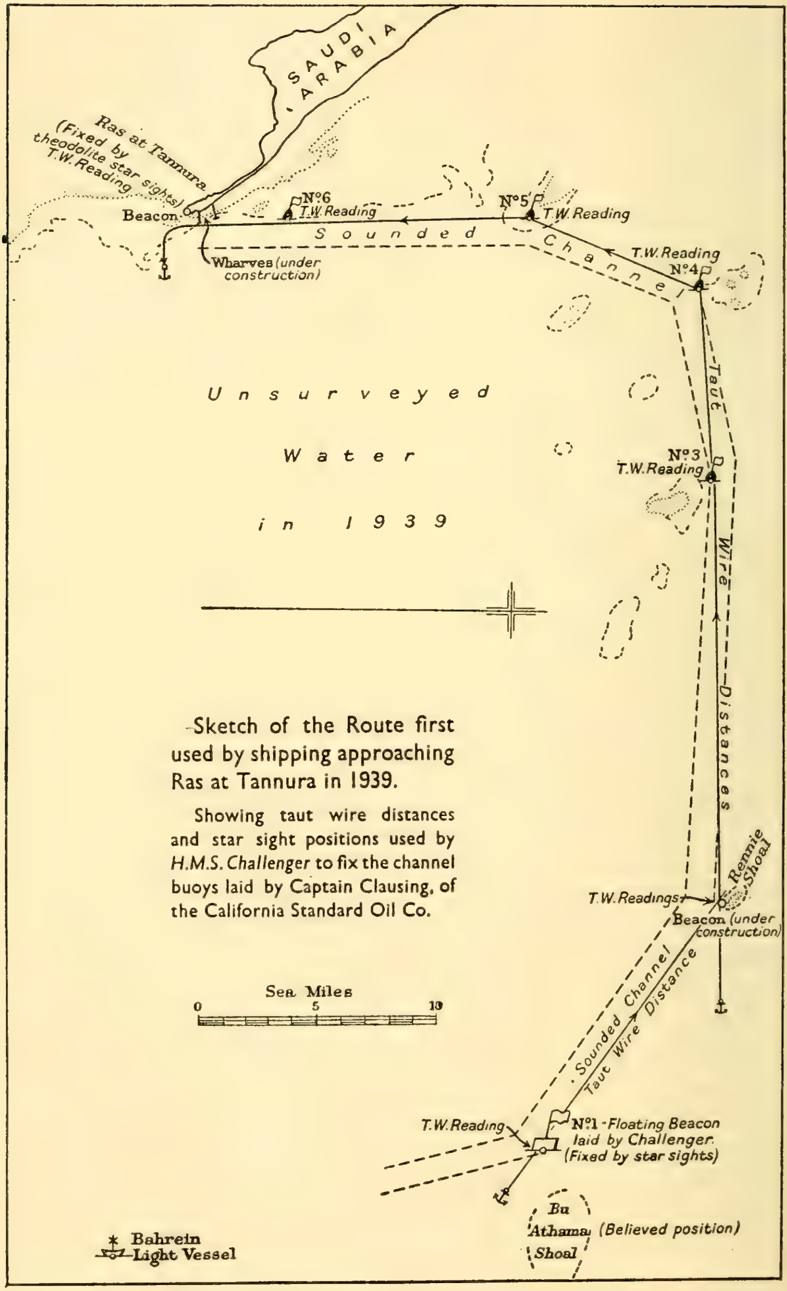
At the last moment, however, the Sheikh's heart must have failed him for he arrived at the camp on Thursday with his complete army, consisting of about eighty ruffianly looking Arabs armed with an assortment of rifles of various ages and calibres, and with a banner proudly floating above them as they approached. The Medical Officer went out to meet this formidable party, shook hands with the Sheikh and his brother and led the army towards the tents where Buck, in full naval uniform, was waiting to greet them. The Sheikh seemed ill-at-ease and made every excuse possible for not coming onboard the ship. His advisers, of whom there seemed to be a number, appeared to believe that his departure onboard would end either in his drinking poisoned coffee or in his being kidnapped. So the proposed visit to the ship had to be abandoned, but the Captain was able to thank the Sheikh personally for the fact that none of the survey marks had been touched during the course of *Challenger*'s work on Masira.

It is sad to reflect that Sloan Miller, who had done so much for these islanders of the Arabian coast, died at the hands of the Egyptian mob in the Gezira Sporting Club in the post-war Cairo riots.

Christmas was spent this year in Karachi, and on completing the work at Masira, *Challenger* entered the Persian Gulf and sailed into Khor Kaliya, the anchorage close south of Manama. This is the seat of the Sheikh of Bahrein, an island having political treaties with the United Kingdom, lying half-way up the southern side of the Gulf, between the territory of the Sheikh of Qatar and the northern coast of Saudi Arabia.

The California Standard Oil Company were at this time building a refinery on the Saudi Arabian coast about 25 miles north-east of Bahrein, whence oil was to be exported from the wharves now being constructed on the east side of the long, low headland of Ras at Tannura. To reach these new wharves it would be necessary to navigate in through reefs, out of sight of land, for a distance of about 50 miles along a little-surveyed channel. Captain Clausing, of the oil company, had laid down some spar buoys as a guide to himself when he piloted vessels in through these reefs, but the courses he had to steer to clear the dangers were not those he would have expected by studying the existing chart. *Challenger* laid a large permanent surveying beacon at the seaward limit of the channel and fixed it by star sights. Such beacons carry huge flags 30 feet above the surface of the sea and are moored with heavy anchors and many fathoms of wire rope. They are used by surveyors as triangulation marks when working out of sight of land, and the laying and recovering of these cumbersome buoys forms a considerable feat of seamanship.

Surveyors use a taut wire measuring machine to measure accurately distances at sea by streaming piano wire under tension astern of the moving ship, the end having been anchored to the sea-bed. Up to 140 miles of wire can be used, and it has startled more than one enquiring taxpayer to hear that no attempt is made to recover this wire. The thought of steaming stern-first for many miles to reel up thousands of yards of kinked and coiling piano



SAUDI ARABIA
Ras at Tannura (Fixed by theodolite star sights) T.W. Reading
Beacon
Wharves (under construction)
N°6 T.W. Reading
N°5 T.W. Reading
T.W. Reading N°4
Sounded Channel
Taut Wire Distances
N°3 T.W. Reading
Unsurveyed Water in 1939
Rennie Shoal
T.W. Readings
Beacon (under construction)
Sounded Channel
Taut Wire Distance
T.W. Reading
N°1 - Floating Beacon laid by Challenger (Fixed by star sights)
Bu Athama Shoal (Believed position)
Bahrein Light Vessel
Sea Miles
0
5
10

Sketch of the Route first used by shipping approaching Ras at Tannura in 1939.

Showing taut wire distances and star sight positions used by *H.M.S. Challenger* to fix the channel buoys laid by Captain Clausing, of the California Standard Oil Co.

Approach route to Ras at Tannura

wire is indeed a surveyor's nightmare. This apparatus was now used to measure the distance from the anchored beacon to the inner end of the channel and the distances between each spar buoy, the course to be steered along each leg of the channel also being noted.

Finally, at the inner end of the channel, the ship passed close east of a beacon which had been constructed on the southern tip of the land. A party was then landed at night on this beacon with a theodolite which was used to observe star sights, thus establishing its position. Both ends of the taut-wire traverse had now been fixed, the difference in latitude and longitude of these two positions agreeing within reasonable limits with the differences calculated by working out the taut-wire run between them. The spar buoys were now plotted in their positions relative to the two ends of the channel and the correct courses for each leg were known. It only remained now for the ship to run a number of sounding lines along the axis of this channel, and the approach to Ras at Tannura was established as a safe sea lane.

This was *Challenger*'s first of many visits to the Persian Gulf and her first task in connection with the export of oil from this unsurveyed coast, in which she was later to play a not insignificant part. It was also her first experience of winter weather in the Gulf, which was quite unexpectedly cold. North-westerly gales, known locally as 'shamals', may blow for many days at a time, raising short choppy seas and filling the air with sand until visibility is down to half a mile. Surveying comes to a full stop on such occasions while the ship tugs at her anchor cable in the exposed anchorages off these flat, featureless coasts; only at the eastern end of the southern shores of the Gulf are there high mountains in sight of the sea, the ranges running south from the vicinity of Muscat.

The ship called again at Muscat before leaving the Gulf on 22nd March, 1939. Fuelling at Aden, she went northwards into the Red Sea and to Muhammad Qol on the coast of northern Sudan.

As well as Admiralty charts, the Hydrographic Department produce and have constantly under revision a formidable library of over 70 books, known to mariners as the Sailing Directions.

These 'Pilots', as their official name is, give world coverage, describing the coasts, the approaches to ports and harbours and how best these may be navigated, as well as some description of the ports themselves and the facilities they provide. The description of Muhammad Qol given in the Red Sea Pilot cannot be improved upon:

'The Village of Muhammad Qol, consisting chiefly of Arab huts, lies on the north-western shore of a bight, about three miles south-westward of the western extremity of Sararat; there is a conspicuous fort in this village, also a custom house. There is a jetty in front of the village.'

This, in fact, is a very full description of the extent and amenities of this Sudanese seaport.

Off the jetty were moored two of the dhows which are the trading vessels of this part of the world; the anchors of these craft had been hooked beneath the coral knobs on the sea-bed by a member of the crew who had dived down for this purpose. The huts of the village, rudely constructed of driftwood, corrugated iron and sacking, were stifling within; only the thick walls of the fort could provide the surveyors with shelter from the burning sun at midday. Inside the fort were a few chairs and a battered table, and two police camel saddles of complicated design which appeared to have been little used in a country where an old sack is considered saddle enough for a riding camel. Bats, disturbed by the unexpected intrusion as the opening of the heavy door admitted glaring daylight, fluttered helplessly out into the sun and were easy prey for the black crows which were standing about the sandy outskirts of the village.

The tribesmen had long, woolly, unkempt hair, and carried short camel sticks with which to guide their riding camels, great light coloured beasts which lay around the well, groaning and grumbling.

The ship herself was much under way while surveying the approaches to the port, encumbered as they were with shoals, most of which did not appear on the existing chart. Normally, such coral patches may be seen from the bridge or by a look-out aloft, but a cloudy sky casts shadows upon the water which confuse the observer. On such an afternoon *Challenger* was searching for a sheltered anchorage on the west side of Mayatib Island;

strong squalls of wind were coming from every point of the compass and the day's work had been abandoned.

The Captain's intention had been to anchor on the north side of a charted rocky patch which was clearly visible from the bridge as the ship steamed slowly in, leaving the shoal to starboard. But as she neared the proposed anchorage shoals were sighted to port and ahead of the ship, leaving but a small channel between them and the charted shoal. But this water looked deep and secure and the ship, turning slightly to starboard, crept slowly ahead.

A minute or so later that dreaded, indescribable feeling of a ship touching the ground was experienced by those on the bridge as she grazed along her port side. The Captain at once stopped the engines and ordered an anchor to be let go. He dared not go astern, for with but one screw his stern would have been thrust over to port and thus moved onto the shoal.

A change in the light as a cloud shadow passed now revealed pale green and yellow coral heads beneath the ruffled surface of the water close on either hand, where but a few moments before the dark blue of the water had indicated a deep, clear channel. Of such a pinnacle structure were the coral knobs that the ship's echo sounder never recorded less than eight fathoms.

A sounding boat was lowered to lay a small marker buoy on each of the coral heads which now appeared to cluster about the ship, and slowly the anchor was weighed and the ship turned round. This was not an easy operation for the wind was still gusting, and from whichever quarter the squalls came there was always a coral head dangerously close to leeward. Gusts of wind could be seen racing across the water, rumpling the surface and flecking it with white-capped wavelets. The wind struck the bridge awning, making it thump and rattle, a noise which formed a background to the orders given by Commander Baker as he stood tense upon the bridge, manoeuvring his vessel in this confined space—'Port thirty', 'Stop—half-astern', 'Mid ships—starboard thirty'. He glanced ahead, peering through his polaroid sunglasses which helped him to see the submerged reefs; he looked aft to watch how his ship's stern was swinging into the wind as he went astern. He strode purposefully but unhurriedly from one side of the bridge to the other, to see how far off were the buoys which marked the danger. At last the ship was round and steaming slowly out the way she had come in, the sounding boat feeling her way ahead of the ship.

Next day the ship's divers were able to report that it had only been a graze and that no lasting damage had been done. It was just another of those hazards to which a surveying vessel is exposed when searching for an anchorage in uncharted waters.

The 21st April saw *Challenger* returning to England, the survey of Muhammad Qol completed. She did not know it then, but her peacetime surveying was over for many a long day to come.

VIII

Iceland

The War was very near as *Challenger* hurriedly completed her refit at Portsmouth, and on 25th August the officers and men on leave were recalled from their homes so that the ship might sail for her war station on the following day. From the Humber to Dover the waters of the east coast of England are comparatively shallow and encumbered by numerous sandbanks, and it is only by navigating the channels between them that ships can safely sail along the coast or enter the Thames Estuary and the other ports of East Anglia. With many of the navigation lights ashore extinguished or considerably reduced in visibility as they would be on the outbreak of war, vessels would have great difficulty in navigating those channels. The shallowness of the waters makes the mining of ships off the east coast a comparatively simple task for the enemy, so that in order to reduce the amount of water to be swept daily by our limited number of minesweepers it had long since been planned to restrict navigation to war channels, which were to be marked by lighted buoys every three miles or so to ensure that the convoys kept to the swept and navigable water.

The accurate positioning of these buoys was, therefore, of immediate importance and was an exacting task, many miles at sea off the flat, featureless coast of East Anglia. It was *Challenger*'s first war-time duty to sail along the war channels, and, using taut-wire measurements and shore fixes where possible, to fix the proposed position of each war channel buoy and mark it with a temporary light buoy. Trinity House, who maintain the lights and the buoys around the coast of England, would later lay the large light buoys anchored by their six-ton clumps in each of these marked positions. Thus, in these anxious days just before the outbreak of war, *Challenger*, her gleaming white sides and yellow funnel now painted a uniform grey, was slipping out of Harwich in the dark hours before the dawn, followed by the

Trinity House vessel *Patricia*, as the two ships worked together to mark the narrow sea-lanes of the east coast, which were to be more permanently marked by the upperworks, funnels and masts of the many vessels which were mined and torpedoed when these lanes became so appropriately named 'E Boat Alley'.

By the end of September *Challenger*'s work on the war channels was complete and she was at Sheerness carrying out tidal stream surveys in the Thames Estuary. At this point Commander Baker exchanged duties with Commander W. C. Jenks, who had been in command of the surveying ship *Scott*, now being fitted with a 4-inch gun and depth charges to become an escort vessel.

Commander Jenks was a man to whom surveying was more than his job, it was his whole life. He was a man of stern appearance and a hard man to cross. If he expected his ship's company to work 18 hours a day, then he himself would work 20, and those are the hours that, in fact, he worked during war-time surveying.

With the coming of the War a number of bases and fleet anchorages were being opened up and protected by the laying of booms across the harbour entrances. There was much surveying work to be done at such places; large-scale charts of the anchorages were required; the accurate positioning of the booms and the boom gate vessels required triangulated points ashore and an exact knowledge of the depth of water where these booms were laid; tidal streams had to be measured where these were to be placed; range finder testing charts required the accurate fixing of the prominent marks onshore; there were a hundred and one odds and ends of survey work to be done at these ports and anchorages in the early days of the War and the programme was delayed by the necessity of sailing in convoy between one port and the next.

It was not until the end of October that there was found time to fit *Challenger* with any armament at all, although on a number of occasions low-flying enemy aircraft had been sighted by the ship while working in the Thames Estuary. Two Lewis guns were all that were fitted and this delayed her sailing in convoy from Sheerness to Plymouth, but she was able to overtake the convoy before it reached Dungeness at 10 o'clock at night. *Challenger* broke off from this 'eight-knot convoy', which was proceeding at no more than five knots, when westward of Start Point and steamed on to Plymouth, reaching there at 2 o'clock in the morning. Her entry into Plymouth was not a success and was later referred to as the 'Battle of Plymouth'. It was necessary in war time to flash a code signal to the station ashore before entry into the port was granted; the code word was frequently changed and on this particular night *Challenger* had the wrong signal. The Army had established a battery on the hills overlooking the harbour entrance and the gunners manning it sat night after night longing for the day when they would be ordered to open fire. Their communication with the signal station was good and it was only a matter of a minute or so before their first round was whistling between the bridge of *Challenger* and the fore stay, to the alarm of the officers on her bridge who did not realise what was happening; by now a searchlight beam was lighting up the whole scene and enabled those on the bridge to see the splash of water close on the starboard side as the next round fell short. 'Full astern', shouted the Captain, and soon the ship was at a standstill while confused signalling commenced between the ship, the shore and the examination vessel now closing her to investigate. After some delay the examination vessel was satisfied and *Challenger* entered Plymouth Sound, while the gunners sponged out their guns and longed for the next of these infrequent encounters with the enemy.

The ship was making for 'Port A', a remote natural harbour on the west coast of Scotland, which was being made into a naval base and where the usual surveying tasks in connection with the defences were required. Slow, coastal convoying was a weary business in those early days, when officers were inexperienced and there was no radar to show where the ship ahead moved in the darkness of the winter nights. Hour after hour the officer of the watch would peer ahead looking for the small feather of white that indicated the ruffled water in the wake of the next ship in the convoy; at one moment it would seem far away and he would increase the engine revolutions, but within minutes he would realise with a tingling feeling in the pit of his stomach that he was almost on top of her and would ring down slow speed or stop the engines. The geared rods of the engine room telegraphs, which passed through the Captain's cabin below the bridge, made a churning noise, followed by the tinkle of the engine room repeating telegraph. Sometimes the Captain slept undisturbed by this, but at other times, when there were many movements, he might appear at the back of the bridge, announcing his presence by a gruff enquiry as to how things were going. Yes, it was a nerve-racking business, this convoy work, for hundreds of naval and merchant service officers in these early days of the war. The four hours of the middle watch from midnight to 4 o'clock in the morning seemed like an unending stretch of worry and strain, reaching away almost to eternity. But slowly the hours passed as cups of greasy cocoa punctuated the crawling time and then, quite suddenly, the watch was nearly over and another came to take on the duty as the convoy concertinaed on its way, up speed, down speed, but all the time averaging little more than the speed of a man running, as they crept around the coastline. The complete and utter feeling of contentment that creeps over the relieved watchkeeper as oblivion overtakes him in his bunk cannot be described, it must be experienced.

In such a convoy *Challenger* left Plymouth for Port A at 3.30 in the afternoon of Saturday, 4th November, 1939. The convoy consisted of *Challenger*, the oil tanker *El Alito* and the cable ship *Marie Louise Mackay* under the escort of H.M.S. *Montrose*, an old destroyer. Commander Jenks, being the senior naval officer present, was in charge of this odd little group. A heavy gale blew from the south-west as they rounded the Lizard and headed north-eastwards for the Bristol Channel where the cable vessel was to be detached. The *El Alito* was flying light, without cargo, and at the height of the gale reported herself out of control; but at last, very slowly, she got her head round into the wind and hove to on a course of 240 degrees, making good only two knots. *Challenger* stood by her all through that night in case she should drift in towards danger, and as grey dawn broke and the wind moderated, the little convoy crawled on through the Irish Sea to Liverpool Bay where two more ill-assorted vessels joined up and *El Alito* was thankfully detached. A minor collision between *Challenger* and s.s. *Portavogie* was the next frustrating little incident before the ships steamed slowly on through another night towards the Clyde, where *Challenger* was detached to carry on to Port A independently, navigating her way through the narrow darkened Sounds of Islay and Mull during the next night.

A fortnight was spent at Port A carrying out sounding of areas along the approach channel, laying buoys and setting up shore marks for fixing the boom defences. From here the ship went on to Scapa Flow to be met there with demands for a whole series of surveys in connection with the defences of this fleet base. H.M.S. *Royal Oak* had recently been sunk by a German U-boat which had penetrated the defences and had entered the Flow. This had added a great and overpowering urgency to all work connected with booms and other defences. Work commenced onboard at dawn on Sunday, 24th December, one hour after the ship had arrived at Scapa, and continued unceasingly. The weather was cold and stormy, with frequent snow squalls, while day after day the boats' crews set out from the ship across the grey and white ruffled waters of the Flow. While their fellows in the Fleet came and went in cruisers and destroyers, slipping out through the boom at dusk on their warlike missions, the men of *Challenger* spent their day in drudgery under the unkindest weather conditions; the younger officers particularly, and many of the men, longed to be posted to some more warlike vessel, and many of them requested the Captain for a transfer. But the work was essential and no one could be spared; the surveying went on and on and on.

Work completed in the Flow, the ship steamed round to Kirkwall, where similar surveys were carried out in connection with fixed defences to be laid in the various sounds leading into the Contraband Control Anchorage at Kirkwall, which was crowded with neutral shipping of many nationalities, their national flags painted boldly on their sides, waiting for their turn for examination, their crews cursing the endless delays.

Long, bitter days were spent here by the surveyors in the field, relieved only by the overpowering kindness of the crofters of Orkney. Many a survey party was called into a farmhouse at dinner time, where they joined the family round the kitchen table to eat a boiled fowl and to enjoy the glow of warmth from the hearth after hours spent observing with the theodolite on some blustery hilltop. The lie up period was now only a peace-time memory; every day throughout the year was now a surveying day, come hail, rain or snow.

The defence of harbours by controlled minefields was now being pushed forward at ports throughout the United Kingdom. Roughly, these defences consist of mines laid in exact positions on the sea-bed, which can be exploded under an enemy craft entering the harbour by a watcher in a control station ashore. He explodes the mine when he sees, by taking a bearing and range of the entering vessel, that she is passing over one of the mines. A number of such mines are laid across the harbour entrance and it can be seen that the position of each mine must be accurately plotted if it is to be exploded according to plan. This means that a triangulation network must be set up in the vicinity of the harbour entrance and transit marks connected to this network must also be set up to guide the mine-laying vessel to the correct laying position of each mine.

So here was a huge programme of harbour defence triangulation to be carried out by the three surveying ships which now remained available at Home. Many of these harbours lay in remote areas where existing triangulation stations were difficult to locate; such stations may have been established by the Ordnance Survey 70 or 80 years before and the marked stones lay buried some two feet or so below the surface of the ground. Descriptions of the locations of these survey marks, made by the surveyors at the time they were laid down, were available and it was always necessary to recover two such stations if the measurement of a base was to be avoided and if the network of triangulation being set up was to be connected to the Ordnance Survey of Great Britain, which was highly desirable. The scene, of course, had changed since those descriptions were made so many years ago: new woods had grown up and others had been felled, old buildings could only be located by the ridge on the ground indicating the line of the ruined walls, or new buildings had sprung up to confuse the issue. Days were spent in digging, like treasure hunters on a desert island using a sketch map made by a long deceased pirate, but no successful treasure hunter was happier than these naval surveyors when at last the scrape of the spade denoted a flat stone, and the removal of the last handfuls of earth from the trench revealed the triangulation mark (△) cut clearly in its surface so many years before, still marking the exact position in the survey of Great Britain.

Challenger worked on at Scapa, Kirkwall, again at Port A and at Kyle Akin on the west coast of Scotland. She returned to Portsmouth for a refit in March, but while the refit went forward there was little respite for the surveyors, who were occupied with defence surveying in and around Portsmouth and Spithead. In early April the Germans invaded Norway and the 'hot' war had begun. This was marked in *Challenger* by the fitting of two pom-poms on the forecastle and the refit was hustled forward. Many of the experienced men now left the ship and it was with a new crew that she sailed away again, carrying a number of men who had joined the Navy for the duration of the war only and knew no difference between a surveying ship and a destroyer during their first days onboard. The same round of harbour surveys in connection with controlled mining defences went on—Plymouth, Milford Haven and then to Sullom Voe in Shetland, where work was completed by the end of May. In the Shetlands the Germans were now only 200 miles away across in Norway; an airborne attack against our northern outposts seemed a likely possibility so the boat sounding, coastlining and observing parties were armed with revolvers and rifles. It seemed difficult to believe, as the surveyors walked the sunlit moors of Shetland in glorious summer weather, that in the Low Countries men were fighting and dying while the situation grew more desperate every hour. Once again the junior officers longed to leave surveying and to get to grips with the enemy, but Commander Jenks, sympathising with them though he did, also realised more than anyone onboard the importance of preparing firm defences of our fleet bases and how very soon now they were likely to be tested. Sixteen hours of every day, seven days of every week, he kept the officers and men to their task. Long days of field work were followed by hours of plotting and inking-in the detail, while the dawn saw the boats away for more sounding or observing.

Britain had at last taken a firm course in Northern Waters, occupying Iceland and the Faroes, knowing how important it would be to use the long, secure fjords of these islands as fuelling bases from which her ships could sail out to intercept the raiders outward bound to harry our shipping on the wide oceans. These fjords were little surveyed, and H.M.S. *Franklin*, another naval surveying ship, had recently sailed north with the forces occupying the Faroes and was now carrying out a survey of Scaale Fjord, the fine landlocked anchorage in those islands.

It was now thought at Scapa Flow that Lieutenant-Commander Prien had entered in his U-boat to sink the *Royal Oak* by one of the four eastern channels. These entrances had been considered to be effectively blocked by the sinking of a number of old merchant ships both before and since the outbreak of war, but now it seemed that there were one or two small remaining gaps, through which flowed the swift tidal streams, where there was just sufficient room for a submarine to pass if piloted with supreme skill. Only a solid causeway across these four entrances would absolutely ensure no repetition of Prien's masterly feat of seamanship with disastrous effects upon our Fleet within. But to build such a causeway and block the very strong tidal streams running here might so increase their force in the two main entrances of Hoxa and Switha Sounds that it would be impossible to maintain a boom there. To test this possibility before building the causeway a tidal model of the Flow was to be built and for this an accurate tidal survey of the existing Eastern Channels was required, and it was for this purpose that *Challenger* sailed from Shetland to Scapa; but when she reached there orders came to transfer these instructions to *Franklin*, newly arrived from Faroes, while *Challenger* was to proceed without delay for surveys in Iceland. Within a few hours of arriving in Iceland the fleet net-layer, H.M.S. *Guardian*, which was to lay the net defences across the mouth of Hvalfjord, had struck an uncharted rock and could do no more. Good charts of the Icelandic fjords were required and *Challenger* must make them as fast as she could.

Surveying ships do not often operate in company and seldom do they meet each other, but when they do there is much to discuss and a reunion party always results; the officers of both ships, many of whom will have served together on other stations years ago, will speak of the eccentricities of former mess-mates, the capacity of their present Captains to force the pace of the work, and recall perhaps a hundred amusing incidents of the past

IN THE FLOATING DOCK—BERMUDA

THE NEW FURNACES ARRIVE IN BERMUDA

from surveying in Labrador to the lie-up in Hong-Kong. Just such an evening developed in *Franklin* when she met *Challenger* in Scapa Flow in that unhappy June of 1940, whilst the two Commanding Officers transferred instructions in the 'Cuddy'. *Challenger* lay at anchor a few cables away across the Flow, appearing dull and drab in her war-time coat of grey paint, the tiny pom-poms on her forecastle looking hopelessly inadequate for the voyage, unescorted, across the grey northern wastes to Iceland on which she was to set out next day.

These were desperate days; there was the possibility of the country being over-run by the enemy and the British were determined to fight on even from Canada if need be, whither they would take their fleet. In such an eventuality Iceland with its spacious fjords would be invaluable as a spring-board for returning to the attack in Europe. Surveying has to take account of eventualities, for the survey must be complete before the harbours are required, and such work is laborious and takes months of undisturbed and patient labour. The task in Iceland was to survey at once the fine harbour of Hvalfjord on the west coast, after which other good anchorages on the east coast of Iceland were to be tackled. But all this work lay ahead as *Challenger* anchored off Reykjavik, the crew knowing they would soon be working harder than they had ever done in their lives. The scene was new and unforgettably beautiful: away to the north-east could be seen the towering flat-topped mountain called Esja, and beyond it, on the opposite side of Hvalfjord, the equally precipitous Akrafjall. Close round the ship and to the southward lay the little rocky islets of the bay with their vivid green slopes contrasting with the gay red and white houses of the town of Reykjavik.

The British Naval Headquarters had been set up in the Borg Hotel in Reykjavik and *Challenger*'s Captain was already ashore there discussing the numerous surveying requirements for Iceland. The Head of Hvalfjord on a scale of 6 inches to the mile and the whole of the rest of the fjord on a scale of 3 inches to the mile was decided upon. Jenks returned to the ship having added to his staff a pleasant-looking student from the University, Bragi Kristiansson, who would act as an interpreter when questioning the local farmers as to the whereabouts of survey marks laid down by the Danish surveyors years before.

Soon the ship was steaming up Hvalfjord, wild mountains towering on either hand, all of the same peculiar formation, with flattish summits and precipitous rocky sides dropping away for about half their height, after which they sloped in great screes scattered with boulders until they merged into the green fields of the coastal strip. Here and there farm houses lay dwarfed by the towering rocks, their small fields, sheep pens and cattle sheds with cattle and sheep looking like children's toy farms.

As the ship steamed slowly up the fjord, sounding her way in these well-nigh uncharted waters, Bragi Kristiansson stood on the open bridge with the Captain and Tim Connell, the navigator, as he pointed out the chief landmarks and named the farmsteads and the rivers, the latter of engaging interest to Tim, an ardent fisherman, who had heard of the great salmon fishing to be had in Iceland. Perhaps he would be able to fit in just a few hours of fishing in the weeks ahead. Gradually the fjord turned to starboard and more and higher mountains came into view, their flat tops carrying the eye beyond them to the snow-clad peaks of Botnsular.

Rounding the promontory of Hofdi the ship slowed and came to anchor. No craft of any kind had been seen on the glassy waters of the fjord, nor had people been moving in the fields; it seemed to those onboard *Challenger* that they were steaming alone into the heart of an empty, peaceful land beyond this world and far from the bloody scenes in France of which they heard as each hopeless news bulletin followed another over the ship's radio.

But as the rumble of her anchor cable shattered the silence of the fjord people came running from the farmsteads to the water's edge to stare at this small grey ship, with a strange flag flying at her stern. *Challenger* was the forerunner of war which was now reaching even this remote and lovely place. These people were to see more and more ships as the days passed, first naval trawlers and boom vessels, then store ships, tankers and hospital ships, each with her boats and tenders, and finally the great grey shapes of cruisers gliding into the fjord. The clean beaches were soon to become sullied with floating refuse, the rusting drums, floats, seamen's caps, lifejackets, boathook staves, and many other ugly pieces of flotsam that scatter the shores whenever a great fleet of warships is at anchor. Strange sailors and soldiers were soon to land to erect guns, hideous buildings, and mile upon mile of barbed wire.

When the surveyors went ashore they found the Icelanders pleasant enough and happy to help them in locating the old survey marks whenever they could: they would offer them glasses of fresh milk and smile and pass the time of day.

During the long summer days with practically no real night Commander Jenks was able to keep his men in the field 18 hours a day. In order to get the greatest efficiency he kept the same officers on the same work day after day. Lieutenants B. G. O'Neill and G. P. D. Hall were the two junior surveying officers and these he kept in the boats, sounding continuously from 6 o'clock in the morning, crossing and re-crossing the fjord on their lines of soundings, until even the Arctic summer night became too dark for them to see to fix; this would be about 10.30 p.m., after which they would spend three or four hours in the chart room inking-in the day's work. These two young lieutenants felt they should be in destroyers or the Fleet Air Arm, hitting the enemy, but they were left little time to ponder on these possibilities during the hectic days of surveying.

Lieutenant D. L. Gordon had a neater hand than even most surveyors and Jenks selected him for the drawing of the collector tracing. Onto this he transferred details from all the field boards, so that on the day the field work was finished there would be a complete record of the work on tracing cloth from which copies could be printed by a sunprint process onboard for use within the Fleet until the Admiralty produced the properly printed chart. 'General' Gordon, as he has always been called in the Surveying Service, has a fine sense of humour and can give an amusing account even of his employment as a draughtsman for 18 hours a day; and he needed his sense of humour as he drew thousands upon thousands of minute figures denoting the soundings on the many surveys *Challenger* completed in Iceland. He worked the same hours at his chart table as the men in the field, day after day throughout the summer and autumn of 1940; vagaries of the weather never held him up on his steady plodding work.

Those working in the boats were often overtaken by sudden storms of intense fury. Out of a clear blue sky and without warning the wind would come sweeping down the mountainsides, striking the water of the fjord and whipping it into a smother of white foam and lashing spray and stirring up numerous little whirling water spouts which raced across the fjord. On such occasions the boats hurried for shelter under the lee of the nearest island and lay tossing there as the rain came slanting down. The Boatswain in the ship ran to the forecastle to let go the second anchor and veer more cable as the ship began to tug at her moorings. But the sun soon came through, the rain passed off with a brilliant rainbow and work began again.

All through June the survey of Hvalfjord went on; at the end of the month it became necessary to return to Reykjavik to land a rating for hospital treatment and to take in stores. At the entrance to the fjord the wind was blowing hard and five British soldiers from the newly established battery were found adrift in a small boat. It was lucky that *Challenger* found them, for within an hour the east wind had developed into a full gale and when the ship anchored at Reykjavik at 3 o'clock in the morning it required both anchors down with seven shackles of cable on each to hold the ship. Soon after 5 o'clock in the morning the aircraft carrier H.M.S. *Argus* was seen to be dragging her anchors and within three minutes was ashore to leeward beam on. In such a gale it was impossible to render assistance to tow her off, but there was no immediate danger to personnel. The weather moderated slowly during the day and at 10.30 at night, on the rising tide, *Challenger* and two trawlers began towing operations. *Challenger* towed from *Argus*' after fairlead, and the two trawlers from a fairlead amidships, but it was difficult for them to keep their bows up into the wind as they hauled, and gradually they fell off, parting their wires. *Challenger* was assisted by a small local tug to keep her head up into the wind and she hauled steadily while *Argus* worked her engines astern, her crew of some hundreds of men jumping on the quarterdeck. Such jumping, if done in complete unison by the crew, has the effect of lifting, if only slightly and momentarily, the bows of even the largest vessel and this sometimes assists in refloating a ship grounded forward. Ever so slowly, about midnight, she came free, *Challenger* continuing to tow until both ships were in open water clear of the harbour.

By next day the gale was blowing again and *Challenger* lay at anchor in Reykjavik Roads surrounded by assorted small naval craft—trawlers and a frigate or two, all yawing this way and that across the wind. Anchor watch was set in *Challenger*—an officer posted on the bridge to observe bearings of objects ashore to detect whether the ship was dragging her anchors—while a small party of seamen were huddled beneath the bridge superstructure waiting to veer more cable or to work the engine-room telegraphs; down in the engine room all was ready for slow speed. Anchor watch is a dreary business which may last for days at a time in these stormy seas; but on this occasion it was soon to be proved most necessary. A trawler anchored ahead of *Challenger* began to drag her anchors and was soon driving down rapidly towards the ship. The officer on the bridge ordered the cable party to veer cable, and by going slow ahead with the wheel hard to starboard he managed to stop the ship from sheering across the wind for long enough to allow the trawler to go careering down the port side of *Challenger* and just clear of her. The trawler went ashore, and she could easily have taken *Challenger* with her.

It can be seen that the visits to Reykjavik away from the survey ground were not as restful as they might have been. One night Brian O'Neill and Geoffrey Hall were dining and dancing at the Borg Hotel with some charming Icelandic girls when the Naval Staff Officer (Operations) came over to their table with a grim expression and asked Hall to step outside into the foyer for a moment. Arrived there, he handed Hall a letter, saying that it was for the Captain of *Challenger* and that he should deliver it onboard as soon as possible. Hall asked what the letter might contain that made it so urgent, to be told that it carried news of a German convoy which had been sighted off the south-east coast of Iceland, steaming in a westerly direction and heavily escorted. The convoy was expected to reach Reykjavik about noon next day.

Hall signalled to O'Neill and both made excuses to their party, saying they had been ordered back to the ship, and took their hurried departure. As they made their way to the landing stage the seriousness of the situation came home to them, giving them a feeling of excitement mingled with fear. There were very few offensive ships in Iceland at this time and *Challenger* carried only two small pom-poms. Signals by torch from the jetty to the ship eventually resulted in a boat's coming inshore for them and by midnight Hall was in the Captain's cabin giving him a shake. He sat up in his bunk, wearing his pyjamas, and read the letter, an expression of fury slowly spreading across his face. 'My God,' he said at last, 'if they think that's what we're going to do while the enemy carries out an invasion they're very much mistaken. Have a boat alongside for me at 0530. Good-night.' The letter had, in fact, carried the news which the Staff Officer had told Hall, and had further instructed *Challenger* to carry on with her survey of Hvalfjord.

At 5.30 in the morning a little group of officers saluted as the Captain, grave faced and tense, descended the ladder into the waiting boat. Meanwhile all preparations were being made onboard to get under way, and for action; the two small guns were being provided with ammunition. The officers and men moved around with a curious sinking feeling in the pit of their stomachs; 'lone survey vessel goes down fighting against supreme odds'—some imagined their obituaries to read in the papers at home. Half an hour later the Captain was back onboard, coming up the gangway with a half sheepish, half furious expression on his face. The little group of saluting officers awaiting desperate orders saw a ghost of a smile pass over his face. 'A bloody Army Exercise,' he said.

The following months of July and August were also spent in and around Hvalfjord, surveying for the boom and the controlled minefield near the entrance. Their old friend the Trinity House vessel *Patricia* arrived to lay the navigational buoys in positions indicated by *Challenger*. But at last these surveys were all complete, and by 1st September the ship lay at Reykjavik awaiting further orders. These soon arrived and gave instructions for the carrying out of surveys of three fjords on the east coast of Iceland. H.M. Ships *Hood* and *Repulse* had recently been lying in Reydarfjord, but now it was desired to use three of the smaller fjords, all of which were incompletely surveyed; these were Seydisfjord, Akureyri in Eyjafjord and Hrutafjord. Secure anchorages in Iceland were invaluable, for ships based there could dominate the Denmark Strait and the Iceland-Faroe Channel through which the enemy raiders had to sail to reach the high seas. The survey of each fjord followed a similar pattern: the entrances for the booms and the controlled minefields, and on a large scale the anchorages within and the narrow parts of the fjords where navigation was in any way difficult.

More and more members of the crew were called on to give the surveyors assistance in the field and large parties of men were landed to search for and mark the existing triangulation stations. On one occasion the Chief Boatswain's Mate was in charge of such a party. Many attempts had been made to find an essential survey point but without success. Commander Jenks had said that it must be found, and even that the eventual finder would be rewarded. As night fell the Chief Boatswain's Mate returned triumphant and was ushered into Commander Jenks' presence. But the smile on the Captain's face quickly vanished when he saw that the Petty Officer was holding in his hand the iron plate which once had marked the position of the triangulation station to within an inch upon the earth's surface.

Friendliness was met with from the country people of Iceland as the parties worked through the perfect autumn days; cold misty mornings with cloudless skies gave way to glorious afternoons and evenings as the sun's rim touched the line of the western hilltops, illuminating the cliff-sided fjords with a soft rose light reflected from the silver surface of these long arms of the sea.

The vast programme was completed by 22nd October, when the ship returned once again to Reykjavik. The great areas surveyed, combined with the impeccable accuracy upon which Commander Jenks always insisted, will undoubtedly make surveying history, and his work here in Iceland ranks with that of the great surveyors of earlier days.

IX

War at Sea

In October of 1940, with the surveys of Iceland complete, *Challenger* sailed southwards for a refit period in England. Almost as soon as she put to sea the winds began to blow and a gale harried the ship the whole way across the grey wastes of ocean between Iceland and Scotland. The wind howled relentlessly in the rigging, the ship heaved, pitched and rolled, the seas thumped against her side and blanked the portholes with green and white as the waves rose towards the upper deck. The men below in the mess decks cursed with rage as they wearied of constantly bracing themselves against the rolling of the ship.

In the Pentland Firth on the forenoon of Sunday, 3rd November, the ship joined a convoy bound for the east coast across the Moray Firth and round Kinnaird Head. The Senior Officer of the convoy escort, sailing in the anti-aircraft cruiser *Curacao*, ordered *Challenger* to take up station as rear ship of the port column; at about 6 o'clock that evening a merchant ship named *Eros* joined the convoy, having come from Invergordon: she had recently been torpedoed and the repairs made temporarily to her bows were plain to see. She took up station astern of *Challenger*.

As dusk closed in, the convoy crawled on at six knots on a south-easterly course about seven miles off Kinnaird Head. Soon the sound of aircraft could be heard and gunfire was seen from *Curacao*, who had moved out to a position about three miles on the port side of the convoy. A few minutes later the men at their A.A. defence stations in *Challenger* saw a twin-engined float-plane coming in low on the port beam. The two pom-poms on the port side were soon in action; seconds later there was a thud, and looking astern those on the bridge saw a huge column of water and smoke rising on the port side of *Eros* to the height of her masthead; the plane passed out of sight astern in the gathering darkness and grey, low cloud.

Soon the attacking aircraft was in sight again, coming in on

Challenger's starboard quarter at a height of 50 feet. The guns opened fire when the plane was about 400 yards away, the tracer bullets appearing to travel right into her; she banked steeply and, passing between *Challenger* and *Eros*, disappeared to the eastward.

It had been assumed at first that *Eros* had suffered a near miss by a bomb, but in fact the float-plane had launched a torpedo, which had passed narrowly astern of *Challenger* as it went on its way to hit *Eros* on the port side. Although *Eros* did not as yet appear to be taking on a list, she was dropping astern quickly into the darkness, and just before losing sight of her Commander Jenks decided to go back and investigate.

It was pitch dark when *Challenger* got back to *Eros* and it could only be dimly discerned that the two lifeboats were gone from the starboard side of her boatdeck. She appeared utterly deserted, the lifelines and boats' falls trailing in the water as she moved sluggishly to the gentle swell. She had a slight list to port and was down by the stern about five feet.

The whaler was lowered, with the seaboat's crew and Lieutenant O'Neill in charge, to cross to the stricken vessel and investigate the possibility of taking her in tow. As the seaboat pulled across to *Eros* those on *Challenger*'s bridge heard quite clearly the cries of a demented being coming, apparently, from somewhere within the deserted ship.

O'Neill climbed the jumping ladder which had recently been used by the crew to abandon the ship. He then walked along the empty decks, calling out to see if any man remained onboard. He neither saw nor heard any living thing except the ship's cat which he carried down to the boat; all he had heard was the dismal slopping of the sea water that had entered the engine room and stokehold.

Whilst awaiting the return of the whaler Commander Jenks had sighted the two lifeboats from *Eros*, which could be seen dimly about a mile away in the direction of the shore. They were hailed strongly and they turned back towards *Challenger*.

As O'Neill reached the bridge to report to the Captain that there appeared to be no life onboard the damaged vessel, the desperate cries came clearly over the water again, so back went the seaboat. Accompanied by Able Seamen Harry Barbour and Charles McKenna, O'Neill started to search the crews' quarters, shouting continually and inspecting every compartment until the engine room was reached, where the noise of sluicing water was now very great every time the ship rolled to the swell. The small party then worked along the narrow well deck passage, their thoughts turning to the flooding water and the possibility of the ship's foundering at any moment as they got further and further from the clean air of the upper deck, which now seemed one of the most desirable places imaginable. At the end of the passage tappings were heard from the stokehold below. It was not possible to enter from the port side so that it was necessary to work round to the starboard side before the stokehold could be reached. In the darkness somewhere below the voice of the trapped man could be heard, crazy with fear; he called desperately for help, but could not be persuaded by the searchers to tell them how they could get down to him through the darkness; all that he could tell them was that flood water prevented his reaching the deck by the usual ladder.

The rescuers worked their way round the base of the funnel and got onto the steel gratings above the boiler casing; from there with a torch the trapped man's head could be seen, above the top of the end of the boiler casing but below the gratings on which they were standing. These gratings were formed of narrowly placed steel bars, imprisoning him like a rat in a cage as the water rose below him. There were two rungs of the grating rather more widely spaced than the others, and slowly, bit by bit, the hysterical man was encouraged to crawl along between the top of the boiler and the gratings to this opening. He was covered in water and oil fuel and was being burnt on the boiler casing as he made his way along. But once he had squeezed wildly through the gap he recovered quickly as he poured thanks on his rescuers and shivered in the stern of the whaler.

O'Neill reported that Barbour and McKenna had no thoughts for their own safety and had to be restrained from entering the dark, flooded stokehold of the ship which, as far as they knew, might sink suddenly at any moment. McKenna had served in merchant ships and his knowledge of their layout was invaluable as the rescue party groped their way through the darkness guided only by the cries from the stokehold.

By now the lifeboats had come alongside and as *Eros* appeared to be settling very slowly Commander Jenks intended to take her in tow and hoped that he would be able to get her into Aberdeen before she foundered. The Captain of the *Eros* persuaded a number of his officers and men to go back to the ship with him to make fast the tow. Some considerable delay occurred before a 7-inch manila rope was roused up from aft in *Eros*; this rope was 90 fathoms long and was secured, with the help of the Fraserburgh lifeboat which had now arrived, to *Challenger*'s 3½-inch wire hawser of 250 fathoms. This work had to be done with the minimum of torchlight as enemy aircraft could still be heard in the offing, flares were being dropped in the distance and anti-aircraft firing was continuous ashore. It seemed that the tow would never be ready, but at last all was secured and *Challenger* moved slowly ahead.

Anxiety was felt by both Captains as to the possibility of towing such a large vessel with this light gear; the soft eye of the manila was shackled to the wire hawser which gave a sharp nip where considerable chafe might develop. But in fact the ship was got under way with ease and she followed steadily at a speed of 4½ knots. The tow continued southward through the night and at daylight off Aberdeen *Eros* was handed over to the tug *Sabine*, who took her safely into harbour to sail the seas another day.

The Royal Naval Dockyards had long since been working to capacity and now it was commonplace for naval ships to be refitted by commercial ship repairers; and in early November, 1940, *Challenger* was taken in hand for her annual refit in the East India Dock, Blackwall.

However clean a ship may be at the beginning of the refit, and however comfortable, there is a rapid deterioration as soon as the refit gets going. The water system is taken apart, the lavatories are closed, the galley is torn asunder—it is like having one's house completely rebuilt and yet trying to remain living in it. Gradually the amenities disappear; portable galleys, shore wash rooms and lavatories never satisfactorily replace those of the ship. Above all, in winter time the shore supply of power is invariably inadequate for the needs of the vessel, giving but a dull red glow to one bar of the electric radiator and a depressing half-light throughout the ship. In the winter of 1940–41 *Challenger* suffered all these discomforts, with nightly bombing by the enemy as well.

Conditions were so uncomfortable that arrangements were made to keep only the minimum number of men onboard at night; an officer and ten men formed the fire party to deal with the incendiary bombs which fell nightly over London. Except for this small party the ship was deserted from 5 o'clock on these winter afternoons until 7.30 the following morning. As the bombs crumped and the ack-ack guns thumped away around the docks the fire party gathered in the ill-lit galley to cook a communal supper. Alone in the cold wardroom sat the duty officer, huddled over the tiny glow of the radiator—perhaps the loneliest man in all London. He longed for the pale watery morning and the arrival of the workmen and his relief.

Amidst the hammering and rattling of the rivetters in the unheated chart-room, the surveying officers daily worked on their fair sheets of Iceland; true, prints taken from the collector tracings had been used to make the charts which had already been supplied to the Fleet, but the fair sheets were required for the permanent record of this important work. The days of the warm drawing office ashore and the leisurely pace of draughtsmanship were gone; it was hustle, hustle all the time with two or sometimes three officers taking it in turns to work on the same chart.

But there were days of leave, quite a number of days, to compensate for the dreariness of the ship at this time. The officers and men packed their suitcases, and taking a last look at the grey ship with the frayed ropes' ends from the dockyard stages blowing in the keen wind, they walked out through the formidable dock gates into the bustling, mean streets of the East End of London, where daily they saw more signs of ruin and destruction. Four who walked ashore so happily for leave never returned to their ship; they were killed by a direct hit from a bomb on an East End milk bar.

General Gordon paused in his drawing of the Iceland charts, upon which he had now been employed for so long, and went to the makeshift mortuary where the dead sailors were lying with over a hundred other mangled bodies. It had been a terrible night, and when he had done his dreadful duty of identifying the sailors he stood outside the building; his legs shook, he felt sick, and for a few minutes was unable to walk away. A young doctor who had been working through the night came out of the mortuary—'Just like a butcher's shop, it's ghastly,' he said.

By the end of January all was ready for sea, and Vice-Admiral Edgell, the Hydrographer of the Navy, paid a visit; this was all he was able to see of his ships in these days, and these visits were always appreciated as they made everyone onboard feel that the Chief still gave much thought to the ships despite his overwhelming occupation with chart production and supplies which had by now reached enormous proportions.

The new internal degaussing coils had been run round the ship as a protection against magnetic mines. These were calibrated by taking the ship over the degaussing range at Tilbury before she sailed down river and into the Medway at Sheerness, where she arrived during an air-raid. Enemy aircraft were flying low through broken cloud, and the ship's guns were in action; as she stemmed the strong tidal stream so that the men on the forecastle could secure her to the buoy a barrage balloon came drifting down on the wind in flames, narrowly missing the ship as it struck the water.

The first big survey of 1941 was that of Lough Foyle where *Challenger* arrived in mid-February. With bases in Eire denied to us, Londonderry was our nearest port to the Battle of the Atlantic and was growing daily in importance as a base for anti-submarine vessels, frigates and corvettes as the battle gained in intensity. Many of these vessels were having difficulty in navigating the long channel through the lough and up the river to Londonderry. Whether this was bad navigation or a change in the channel itself was not readily apparent: it is natural for many seafarers to question the chart before questioning their own navigation. However, in view of the ever increasing importance of Londonderry and the plans that had been formulated in the Admiralty for wharf construction in the river at Culmore, the Hydrographer was taking no chances and ordered a re-survey of the whole channel and river approach to Londonderry.

This was a formidable survey and Commander Jenks tackled it with the same determination with which he had tackled Iceland in the previous year. Every boat onboard was pressed into service and men found themselves away in the whaler, sounding under sail with lead and line, to augment the work of the echo sounding launches. Such methods of sounding had probably not been practised for over 40 years, but as long as results were accurate Jenks cared nothing for appearances or discomfort.

The channel as far as Culmore, where it enters the river, skirts the north shore of the lough, and passes within a few hundred yards of the Eire shore in some places. Although main triangulation stations were recovered on the south shore of the lough on which basis the survey was built up, it was still necessary to include some fixed points along the Eire shore. Theodolite parties who landed on this coast were nervously looking over their shoulders and expecting to be interned at any moment, but when a Civic Guard did eventually appear he was only interested in discussing the progress of 'our' war with the English surveyors.

Once the survey entered the river the scale was greatly increased. The reason for this was unknown to those in *Challenger* at the time; it was only later, when the large United States Base and fuelling wharves for their escort vessels were built at Lisahally on the south bank of the river, that it became clear why this survey had been ordered by the Hydrographer in the early part of 1941.

By early May the Londonderry surveys were complete and the ship was in Lough Larne, for this too was to play its part as an anchorage for escort vessels employed in the Atlantic battle. The officers and men of *Challenger* had now served together for some considerable time and many had served under Commander Jenks in Iceland; by now they were well practised in the arts of rapid wartime surveying and quicker results were being obtained as each new survey was taken in hand. But at Larne there was considerable trouble with the triangulation in the upper part of the lough: the triangles observed between the stations which had been erected along both shores refused to close within reasonable limits of 180 degrees. At low water this part of the lough is composed of acres of mudbanks through which winds a narrow boat channel, and across these soft flats it was necessary to walk to reach the triangulation stations on the foreshore. After two or three muddy surveyors had returned with angles which did not add up to the magic figure, the Captain announced his intention of going himself the next day to complete the work—'And I shall want a pair of mud pattens, Number One,' he said to Lieutenant-Commander Henry Menzies, who was already carrying in his head a list of the instruments and other gear which the Captain had ordered; Number One looked puzzled: 'Surely you know what mud pattens are—like a cross between snowshoes and skis with which you can walk dryshod over soft mud,' said Jenks. Busy with his other preparations the First Lieutenant forgot all about the pattens until he reported that all was ready to the Captain in the morning, who enquired if they were in the boat: 'They will be down there in a minute or two, Sir,' said Number One, who rushed down below to see the Shipwright. 'Chippy, for heaven's sake make a pair of mud pattens full speed.' Chippy's face was as puzzled as Menzies' had been the night before. Number One described the pattens as quickly as he could, and very shortly two small boards with four holes drilled in each and a piece of cord attached were passed down into the boat. It was all there was time for, and Menzies reported to the Captain that all was ready.

For Number One it was a long day of waiting, and at 6 p.m. there was still no sign of the Captain returning, but an hour later the boat was sighted on its way back and even when she was still half a mile away it could be seen that the Captain stood in the sternsheets covered in thick black mud from head to foot. Not only had the mud pattens been too small in area to support Jenks on the mud, but once he had sunk in they anchored him securely despite all efforts of the boat's crew to remove him.

Orders for tropical service were now received and the ship proceeded to Greenock, where all efforts were devoted to embarking stores and awnings and generally preparing the ship for service in tropical waters. Only the Captain knew where the ship was bound, but some clue was given to her destination when information was passed to the officers that *Challenger* was to escort a 10,000-ton troopship to a West African port. *Challenger* had relied in the past for her safety in her insignificance on the high seas, and her armament of four two-pounder pom-poms seemed ill suited to this task. However, three corvettes were also to form the escort—H.M. Ships *Lavender*, *Starwort* and *Petunia*—with

Commander Jenks as Escort Commander. The trooper was s.s. *Anselm*, said to be sailing in this special convoy as she had proved too slow to sail with an earlier one which had just left. She carried 1400 troops, the greater proportion of whom were R.A.F. personnel.

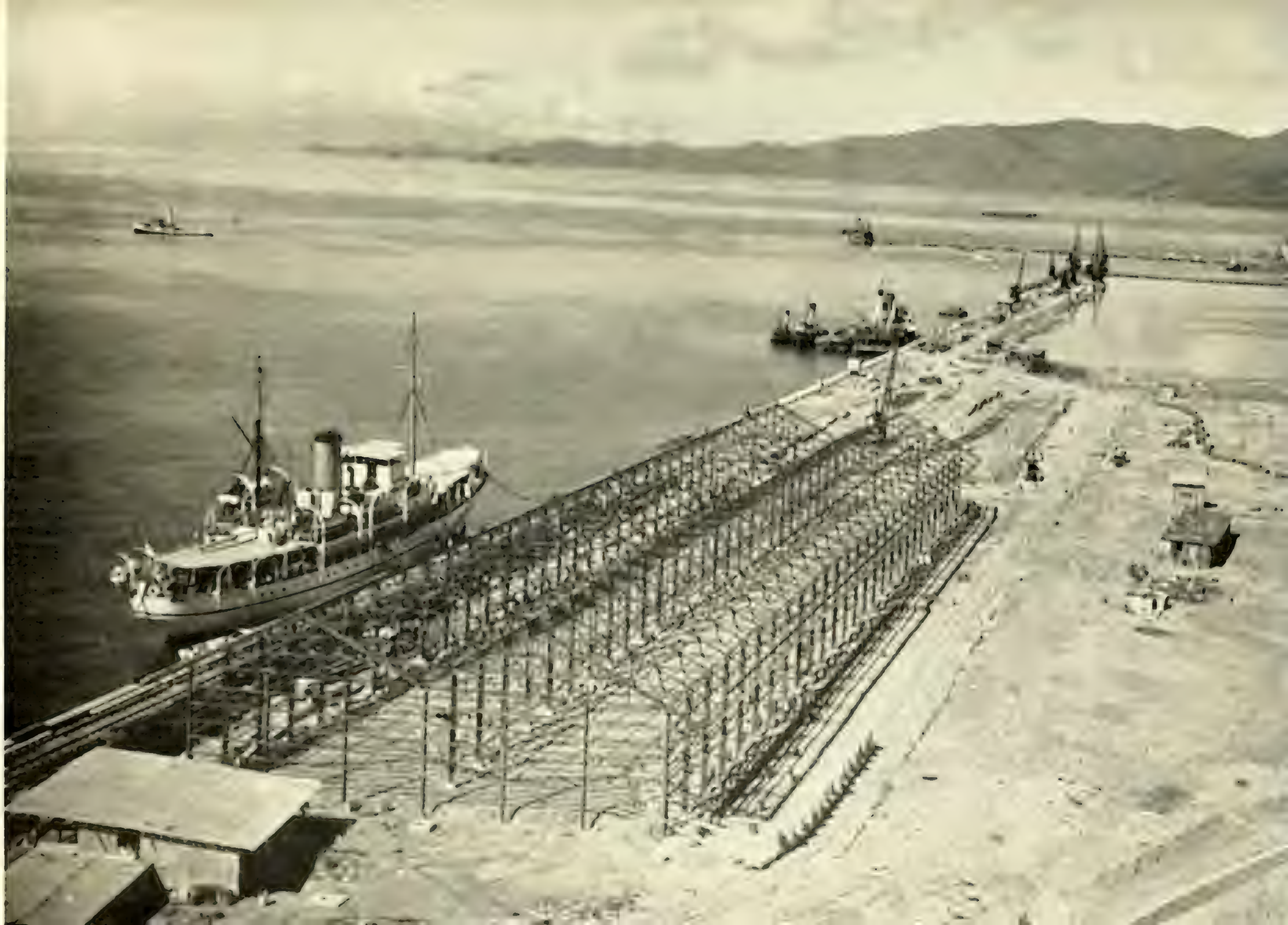
At midnight on Sunday, 29th June, this little convoy sailed out of the Clyde, bound for Bathurst in the Gambia River. A Wellington bomber joined as air escort off the north coast of Ireland, but this heartening support had soon to leave as they steamed westward towards mid-Atlantic.

Commander Jenks had organised his force as follows: *Challenger* in the centre with *Anselm* following astern; ahead and on either flank a corvette formed an effective screen as the little ships searched with their asdic equipment for any contact with a submarine. When well out into the Atlantic the leading corvette signalled that her asdic had broken down and could not be repaired with the resources available; this was disastrous news and meant a complete re-disposition of the force as the van was no longer protected from submarine attack. This corvette was ordered to the rear and the remaining two corvettes moved further forward on the flanks to cover each bow.

The Battle of the Atlantic was now moving rapidly towards its peak. By obtaining radio bearings of U-boat transmissions and by other intelligence methods the Admiralty were able to form quite a good idea of the whereabouts of a number of the U-boats at sea in the Atlantic, and twice daily they issued a coded situation report known as the 'Sitrep', which gave convoys this vital information. Spread out in the surveying chartroom below the bridge was a chart of the Atlantic showing the position of the vulnerable little convoy and the suspected positions of the U-boats as given in the 'Sitreps'. Never was any chart on this table scanned as keenly as it was by the small group of officers as each 'Sitrep' was being plotted; the little swastikas, which represented U-boats, came nearer and nearer to the course of the convoy as it crawled its way southwards across the Atlantic.

There was no avoiding action to be taken at a speed of 10 knots, nor was it certain that the 'Sitreps' could be relied upon as highly accurate. There was nothing for it but to keep going, zig-zagging by day and urging the asdic operators and bridge look-outs to

CHRISTMAS—
1937.
ALONGSIDE
THE NEW
WHARF AT
TRINIDAD



FISHERMEN AT PORT SAID

ever greater vigilance. All onboard were conscious of the vulnerability of the convoy, the low speed, the corvette with the defective asdic gear, the great bulk of the *Anselm*—it was like walking naked through a huge room full of people; the eyes of every U-boat must be upon them.

On the night of 5th July the little convoy was right in the middle of the North Atlantic; the night had been one of varying visibility, fog sometimes cutting off from view the escorts and the troopship. The Captain had been on the bridge nearly the whole night, but shortly after daylight at 6 o'clock the visibility cleared and he went to his cabin to rest and in a few minutes was dozing in his armchair. Just under an hour later he was awakened by the impulsive jarring ring of the alarm gong, the worst awakening known to a naval man, and one which remains in the memory. He ran to the bridge, jostling as he did so the men who were hurrying up the ladders to their action stations. As he reached the bridge he saw *Anselm* astern; she was down by the head with a slight list to port, moving slowly ahead through the water. The Officer of the Watch said that she had been torpedoed—he had heard the detonation and had turned to see a vast column of brown coloured water falling onto the upperworks of the troopship.

Jenks ordered the two leading corvettes to hunt the U-boat while he turned *Challenger* so that she came round astern of *Anselm* where already men were in the water stringing out behind her like a trail of refuse cast overboard, while alongside the troopship boats were being lowered. Slowly Jenks manoeuvred his ship ahead through the drifting men, lowering his seaboats as he went and with the ship's company hauling onboard those men who were able to hold onto the ropes thrown to them. Eventually he was able to put *Challenger*'s forecastle head alongside the troopship's port quarter. Though it was calm there was a swell running and the relative movement of *Challenger*'s bow and the troopship's stern was considerable. Although hammocks were got up to break the fall of those who jumped from the *Anselm* onto *Challenger*'s forecastle, the troops preferred to step across to welcoming hands each time the *Challenger*'s bows came level.

It was a difficult job for Commander Jenks to keep the bows well up to *Anselm*'s stern, more particularly as he was thinking of the future. He hoped to rescue a very large number of men and it was vital that he should not damage *Challenger* so much that it might prejudice the carrying of them many miles across the Atlantic to safety.

The Captain was utterly cool, giving his orders calmly to the Coxswain in the wheelhouse as he manoeuvred his engines to keep *Challenger* in position—his calm bearing was infectious, and all, rescuers and rescued, were behaving magnificently as the numbers of men onboard *Challenger* increased minute by minute.

All this time *Anselm*'s bows were settling slowly and steadily but after about 125 men had stepped across onto *Challenger*'s forecastle the stern began to rise into the air as the bows submerged more rapidly and the sea began to flow in over her foredeck. It was obvious now that she was about to plunge. Only a hemp rope held *Challenger* to *Anselm* and when Jenks saw that she was about to go he shouted to the troops to jump for it as he slowly moved astern, parting the hemp rope as he did so. The stern of the troopship reared vertically into the air, men leaping off all the time in a great fan-shaped mass of humanity. Many landed on the forecastle of *Challenger*, breaking their ankles and legs as they landed, despite the layers of hammocks laid out to break their fall. The trooper's stern was now 200 feet above *Challenger*'s bows and the rudder and screws looked strange in such a position, yet still men were jumping off, hitting the sea with a great splash.

As *Challenger* went astern *Anselm* reached a completely vertical position as her funnel met the water; then she slid down like a giant lift to the accompaniment of the noise of crashing gear and bursting bulkheads. No vortex was created on the surface of the sea—she was there one second and gone the next, leaving the heaving surface littered with a mass of human and material debris.

All *Challenger*'s boats and those of the third corvette were now in the water collecting and bringing onboard many of the hundreds of survivors who were clinging to the wreckage. The other two corvettes were hunting the submarine far away on the horizon: the shudder of their distant depth charges being felt from time to time. The calmness of those in the water was almost unbelievable: many who were on rafts or clinging to substantial pieces of wreckage waved the rescue boats away and pointed to survivors more in need of immediate attention. Discussing the scene afterwards, many realised that they had seen one survivor who had been sitting on an upturned table calmly reading a book and apparently oblivious of the scenes of chaos all about him.

Challenger and *Starwort* became fuller and fuller and the counting of survivors became difficult as the men climbed onboard up the scrambling-nets hung along both sides of the ships. Over 800 men were definitely embarked in *Challenger*, making, with her own ship's company, almost a thousand men onboard the little ship; the even smaller *Starwort* had rescued nearly 300. By 9 a.m. no further survivors could be seen among the flotsam, and it had reluctantly to be assumed that the four hundred or so now missing must have gone down with the ship. There was no longer any point in remaining stopped in this area, a sitting target for U-boats, and so both ships set off with their human cargoes, slowly at first because of the gross overloading and tenderness of the vessels, but gradually increasing speed as confidence was gained, until 12 knots was reached. Any undue movement of the steering wheel caused the ships to heel alarmingly. That the weather should continue calm was vital to survival.

The scenes below in the ship, now packed with wet, bedraggled, wounded humanity were indescribable: every hole and corner held its party of shivering men as they waited patiently for clothing which *Challenger*'s crew provided from their personal belongings, and for hot food from the galley where the ship's cooks were working with a will.

Many were injured and the ship's Medical Officer, Surgeon Lieutenant W. A. B. Cooper, R.N.V.R., aided by Squadron Leader Monro, a survivor from *Anselm*, worked unceasingly for the next 24 hours. Only two men died onboard, and Cooper earned a Mention in Despatches for his great night's work.

A few lines from Commander Jenks' report made soon after the sinking of the troopship are well worth quoting:

> Crammed into every inch of space between decks and on the upper deck, the survivors settled themselves down patiently and quietly for some 24 hours of discomfort and by their ready obedience greatly assisted the ship's officers and company in their endeavours to provide sustenance and warmth. Particularly admirable was the conduct of the Royal Marines detachment who

> had been picked up, they took pains to sort themselves into a regular unit and took over a section of the food distribution duties from the ship's company, and throughout behaved as if on the parade ground.
>
> It was a source of great personal satisfaction that Captain Elliott, Master of s.s. *Anselm*, was among those rescued by *Challenger*. This fine officer was swept from his bridge as the ship plunged under, but arrived on the bridge of *Challenger* after his rescue completely unshaken and physically fit despite his years. He was most anxious to be of any assistance possible and his cheerful bearing was a great asset.
>
> Captain Elliott was 73 years of age.*

Commander Jenks' immediate task must be to rid the ship of her great burden of humanity before bad weather made her unseaworthy. He hoped to rendezvous with the armed merchant cruiser *Cathay* that night, but overcast weather had precluded the convoy getting their position by sights during the last two days, and to rendezvous on the high seas when one's position is doubtful is a chancy business. When approaching the position of the rendezvous towards dusk a momentary sight of *Cathay* was obtained about four miles away to the south-east. Spirits soared but it would have been dangerous to pass a signal either by wireless or by flashing lamp in these U-boat infested waters, nor was it known if *Cathay* had sighted the little convoy. Jenks knew *Cathay*'s course and it soon became obvious that there was nothing to be done but to follow through the night, hoping to find the merchant cruiser at dawn; occasional traces of *Cathay*'s wash meeting the prevailing swell assured the Captain that she was still ahead, and at daylight contact was made with her.

Whilst the three corvettes circled round, *Challenger* went alongside the armed merchant cruiser and discharged her human cargo, the 35 seriously injured men being hoisted in a cradle worked from one of *Cathay*'s cargo derricks. A swell was still running and *Challenger*'s external boat davit supports ground and grumbled hideously against the great liner's side despite the mass of tattered fenders that were constantly thrust between the two ships. However, no serious damage was done and when the last survivor had been routed out from the remotest corner in the little survey ship she joined the circus with the other two corvettes while *Starwort* disembarked her survivors.

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* Captain Andrew Elliott, O.B.E., served a life-time at sea. He survived two World Wars afloat and retired to Woodcombe in Somerset in 1949. He died in February 1957.

With the survivors out of the ship a great weight seemed to have been shaken off. *Challenger* no longer seemed to those onboard to be the No. 1 target. It was absurd, of course, but everyone felt that the enemy would know that *Challenger* had snatched these survivors from their grasp and that every U-boat in the North Atlantic would be closing in on her. But, as always in the war at sea, the passing of one worry is soon replaced by another; fuel now became the important factor. With the delay and much extra steaming necessitated by the sinking of the troopship the corvettes and *Challenger* needed fuel, for who knew how many more diversions and emergencies might overtake the little convoy before they sighted the shores of Africa? Distances were measured on the charts, calculations of fuel consumption made, and a decision reached to fuel in the neutral Azores. So while *Cathay* steamed on to Freetown, *Challenger* made for Punta Delgada in the island of San Miguel, where the ships could fuel two at a time while the other pair patrolled outside the three-mile limit.

The lights shining from the neutral towns and villages and from the isolated homesteads high on the mountainsides seemed lit to welcome the sailors from the horrors of life on the Atlantic, which now seemed neutral no longer but hostile and bristling with death. Foolish jokes brought easy laughter—the tension which had existed onboard was broken in a moment. The ship would be in harbour for only 24 hours, there was no chance of going ashore, and rumour had it that a U-boat was fuelling at the nearby island port of Horta; but all were living in the present. The green hills, with here and there the red soil of the ploughed land, reminded the men of the West Country at home; the white, yellow and even pink houses scattered on the sunny hillsides gave the country an exciting look and remained long afterwards in the memory of many as a heaven that was reached but which it was forbidden to enter.

For three at least of *Challenger*'s crew there was no time to lie on deck and drink in the sunlit scene. Lieutenant J. M. Sharpey-Schafer, the ship's Electrical Artificer and the Leading

Torpedoman had work to do. The corvette with the faulty asdic gear lay alongside; a corvette's resources are small and everything possible must be done to have her anti-submarine equipment in order by next day, when the ships would face the U-boats again together. Sharpey-Schafer had a talent for anything mechanical or electrical, his name being a byword among surveyors for his many inventions; once before during the war he had worked at sea in an asdic compartment for 36 hours to repair an asdic set to such good effect that a successful attack was made on a U-boat the very next day. His knowledge and initiative in this matter resulted in the corvette's equipment being put right, and it was a more confident little party that set sail for West Africa after dark that evening.

X

Gambia River

LONG before the African Coast was sighted the blue of the Atlantic changed to brown as the ship entered the mud-laden water from the Gambia River spreading far out over the sea. Later in the day the low-lying, dark green mangrove forests could be seen stretching away to miraged vagueness on either bow. The ship steadily closed the land and threaded the shallow channels of the estuary before she turned southwards into the river itself and came to anchor in the swirling brown waters off the town of Bathurst.

With the Mediterranean virtually closed, our convoys to the East were taking the long route round the Cape. Bathurst lay on the very flank of this route, an ideal base for escort vessels and aircraft. But Dakar, which we had failed to capture from the Vichy French nine months before, lay less than 100 miles to the north and at any moment the Germans might have flown in airborne troops and built up the defences of Dakar so that this former French base, and not Bathurst, would dominate the convoy route to the Cape. The defences and facilities for vessels and aircraft must be built up at Bathurst so that she could meet any threat from Dakar.

There were no surveys whatsoever of the colony except the old Admiralty chart; hydrographic surveys were urgently required for laying the controlled minefields, booms, navigational buoys and beacons, while land surveys were needed for planning the siting of the guns, airfields and barracks. *Challenger* had therefore to pay as much attention to the topography as to the soundings.

Short-cut base measurements were unacceptable in such a survey where an extensive triangulation would have to be built up across the wide estuary and onto the off-lying islands and up the winding creeks through the mangrove swamps. So a base of 12,311 feet, or just over two miles, was measured on the flat road leading north-westward along the shore from the town. The two measurements, one in each direction using steel tapes, differed by only 1½ inches, which even Commander Jenks considered good going, for it was the longest base measurement in hydrographic history.

The seaward approach to the river was the first area to be surveyed so that the light floats and navigational buoys could be moved to mark the route that carried the deepest water across the sandbanks of the estuary, where little more than 26 feet of water at low tide was found. Some of the surveying marks erected along the shore-line were made into permanent navigational beacons so that a vessel could more easily fix herself when closing this featureless coast, and so that the light floats and buoys could be re-laid with ease and certainty at any time. The proximity of the Vichy French was brought home when one of these shore beacons had to be erected right on the border between Gambia and Senegal, only five miles northwards along the coast from Bathurst. On two or three occasions Vichy planes came in low over the surveying boats, or circled the ship outside gun range, apparently looking to see what was going on. Sometimes an enemy plane would fly high over the anchorage off the town and every ship would bang away with her guns until the pilot decided to return northwards.

On completion of the work outside the river entrance the survey moved into the river itself, where every square yard of deep water was required to be known so that anchor berths could be planned and mooring buoys laid with the maximum economy of space. Here the real difficulties began. Up till now the surveyors had been concerned with the estuary, the shores of which were solid earth, where marks could be erected and angles observed with ease. The river, however, which was several miles wide, had no clearly defined banks and on either hand flowed through vast areas of unexplored mangrove swamp. Along the fringe of the mangroves there might be from two to eight feet of water over the soft muddy river-bed, depending on the state of the tide.

It was at points along the fringes of the mangroves that triangulation marks had to be erected; they had to be over 60 feet in height so that they would be visible up to 10 miles away, and at the same time a firm wooden observing platform had to be sunk into the mud beneath the mark to support the surveyor and his theodolite.

Much thought by the Captain and hard work by the shipwrights and the survey recorders resolved these difficulties. A standard survey mark of giant proportions was designed and a number were pre-fabricated onboard. Three long, heavy spars formed the basis of each mark, erected in a tripod; the heads of the spars were held together by passing them through an iron triangle having holes designed for this purpose, while their heels were weighed down into the mud by heavy concrete sinkers. A tall mast was passed up through a fourth hole in the iron triangle and a large flag hoisted upon it, while the sides of the tripod were boarded up and painted white. This formed strong resistance to the wind, and as fierce squalls were frequent, wire guys were run from the mast and the head of the giant tripod to further concrete sinkers which were laid out as holdfasts.

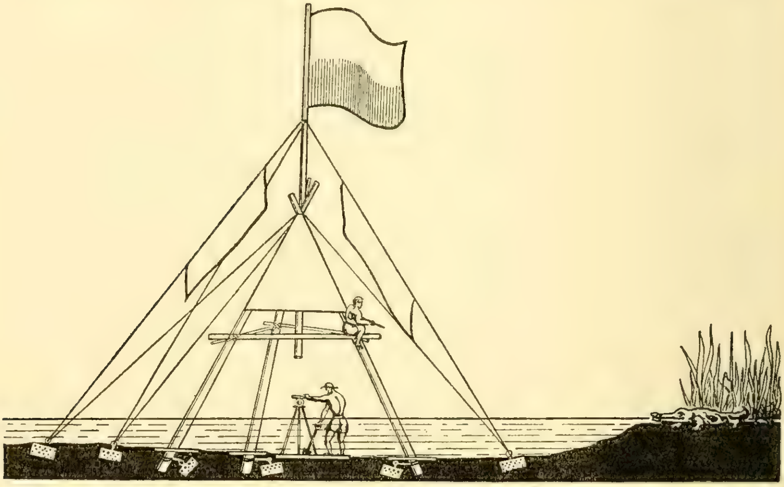
The many components of these marks were taken to the selected site in a pulling boat known as a 'whaler' by a crew of eight men or so; but once in position it was necessary for the team to wade, sinking into the ooze well above the knee at every step. To lay out the concrete sinkers in their correct position for securing the guys was a herculean task; once dropped, they sank beyond recovery into the soft mud. Staggering with these concrete blocks, wrestling with the heavy tripod, feeling beneath the muddy water to reeve the guys through the eyes in the sinkers and to sink the observing platform, the workers floundered and fell on all fours or got stuck while rescuing one another. They returned to the ship at nightfall covered in mud from head to foot, every one of them, as their Captain had been on that fateful day when he had taken the mud pattens away.

When the officers returned to take the theodolite observations at these stations a man with a rifle was posted high on the tripod mark itself to ward off the crocodiles which lay not far away, watching the observer hour after hour as he made his six rounds of theodolite angles, with all the care that this task requires. Steady nerves were needed and a blind faith in the marksmanship of the protector above.

Lieutenant Jack Paisley and his surveying recorder have good cause to remember these survey marks in the Gambia River.

On this occasion they were left at one of the marks to observe in the early afternoon. It had been arranged that another survey party returning to the ship by boat would collect them before dark, but something went wrong with the planning and as night came on the two men could see no sign of a boat on the broad river.

They climbed up to the cross spars and looked longingly at the distant twinkle of light which marked the ship at anchor some five miles downstream. The fall of night had made the crocodiles very active and several were in the water directly beneath the mark. One lashed with his tail against one of the main spars and the whole structure shook terrifyingly. It grew bitterly cold, and to keep themselves warm, clad as they were in their tropical rig, they cut calico from the guys to wrap around themselves, and with rope from the mark they lashed themselves to the spars lest they should fall as sleep overtook them.


Triangulation mark in the Gambia River

Hours later, it seemed, they saw a finger of light searching the mangroves along the river bank. It was the rescue boat using her Aldis signal lamp to search for the lost surveyors.

It was a happy moment for Paisley and his assistant when the light at last picked out the dazzling white of the mark against the dark trees and the boat moved slowly in on the high tide to rescue them.

The survey parties shot one or two crocodiles and when they did so they towed them to one of the riverside villages where the menfolk came out of their mud-and-thatch houses and with knives and hatchets made quick work of skinning the beasts and chopping up the meat which they appeared to relish. Parts of the tail were most sought after as making excellent steaks. The surveyors took the crocodile skins and hoped to have handbags made later for those at home.

Crocodiles were not the only dangers to be encountered when mapping the maze of creeks winding through the mangrove swamps to the bush beyond; there were deadly black and green mamba snakes, and every man carried a razor blade to cut open a snake bite, and potassium permanganate crystals to rub into it, the only efficient antidote. The anopheles mosquito present almost everywhere in the area necessitated mepacrine being included in the daily diet, while the tsetse fly was said to carry germs of sleeping sickness, and one member of the ship's company had soon to be invalided home with this disease.

The sick list had risen steadily until in October the average daily number was nine. Abscesses and infection of the ears, ulcerated legs, and septic wounds, malaria and dysentery were the complaints, perhaps not surprising when the officers and men spent so many hours wading and working in the mangrove swamps on either side of the river.

The climate was hot and very humid, with frequent torrential rain squalls and occasional fierce tropical storms. The powerful tidal streams, strengthened on the ebb by the fast flowing waters of the river, made the steering of the boats along the sounding lines a difficult task.

But as the officers and men worked on under these difficult conditions no one forgot that 'there was a war on', and Commander Jenks, reporting on the behaviour of his men on completion of the survey, said:

> I cannot mention too highly the continued cheerful and willing spirit of the Ship's Company as a whole, and their exemplary behaviour during their short spells of shore leave. These men have endured six months, four of which were

> at a trying season of the year, of very continuous, and to them monotonous, hard work over long hours each day and with little opportunity for recreation, with unfailing loyalty and response to all calls made for further efforts. It is submitted to be particularly to the credit of each individual rating that the work has no appeal in war-time when most of them desire more positive and exciting service.

Fixing the coastline can often be done in the way that has already been described, that is by walking along the high water line and fixing oneself at frequent and regular intervals by a sextant and station pointer fix using three of the visible surveying marks; however, this cannot be done when a twist of the tree-fringed coast cuts off the surveying marks from view, nor when mapping inland roads, villages and jungle tracks. To do such work 'traversing' is used, and there was much of this going on during the surveying of the country on both banks of the Gambia River.

A traverse starts from a known position on the survey and consists of a number of 'legs' at the end of each of which a peg is driven into the ground. The direction of the first leg is found by observing a reference angle at the starting point between it and another mark in the survey, while the direction of each subsequent leg is found by observing the angle between the leg already traversed and that which lies ahead. The length of each leg is also measured so that the positions of the pegs may be plotted. This is done by the surveyor standing at one peg using a theodolite to record the distance to a stave held by a seaman over the next. Such a method is well known to the surveyor, being called 'tacheometry', while the curiously marked stave which makes such measurement possible is known generally as the 'tack' stave.

Such a traverse can be progressed along winding roads or tracks, the surveyor obtaining subsidiary bearings and distances of features such as houses, conspicuous trees or streams, etc., so that topography is built up along either side of the traverse. Traverses eventually terminate on another of the main triangulated marks of the survey, or even the original one from which the traverse was begun. The less important topography such as the remoter jungle tracks are traversed by measuring the legs by pacing them out and finding their direction by pocket compass.

Such secondary traverses were started from a peg of known position in one of the major traverses, and perhaps closed on a peg some two or three miles distant. In this manner the details of the hinterland were gradually mapped as the network of traverses was threaded through the thick jungle, or across the open parklike land where villages abounded and small black children ran out to stare at the sweating sailors carrying their strange apparatus.

Commander Jenks was following his usual war-time routine of employing the same teams of officers and men on the same tasks each day, finding this most conducive to speed with accuracy. By 8 o'clock in the morning they were in the field in their khaki tropical rig, trudging through the long forenoon as the day got slowly but steadily hotter. By 1 o'clock the little party would be ready for their sandwich dinner beneath a shady tree; a short sleep was usually terminated by an African centipede or perhaps red ants crawling over the face or arms, and then the party would work on till sundown.

To an able seaman carrying the stave who had never trained as a surveyor, nor yet had ever imagined himself on duty outside a ship at all, this endless tramping through the African jungle seemed the last thing that he would ever find himself doing when he joined the Navy. Being on ahead he never saw the field board and lost all sense of direction, his only duty being to walk on and place the next peg where he was directed. It never ceased to be a source of wonderment to him when the little party came from the bush suddenly out onto a familiar road—'Blimey,' said one of the stavemen to his officer on such an occasion, 'I reckon there's no one knows Africa like you do, Sir!'

There were two rulers on the north bank of the Gambia River who were anxious to see the ship which had now been moving up and down the river and excited their curiosity. So, anchoring off Essau near the river mouth, Nomandu Sonko, Seyfu of Lower Niumi, was entertained onboard. He was most interested in all he saw, *Challenger* being the first 'warship' he had ever boarded. Commander Jenks furthered the survey by obtaining from the Seyfu a great many place names for his chart—Kunkudella, Latra Sibige, Mandinari, Kinkujung, Willingara—a surveyor pencilled them in on the chart as the Seyfu pointed them out along the river banks. The morning terminated with the Captain's hiring a number of canoes from the Chief so that even more surveying parties could be put into the field to explore and map the numerous creeks and waterways.

Hearing of Nomandu Sonko's visit, the Seyfu of Upper Niumi, who lived 20 miles further up river, expressed his desire to come onboard and the ship anchored off Albreda on a Saturday so that this could be arranged. He came onboard accompanied by a number of his headmen, and before leaving expressed his wish that the ship should visit Albreda again on the following Saturday so that he could entertain the Captain, his officers and men in a way befitting them.

Accordingly the next Saturday the Captain and his officers, accompanied by 30 men, landed at Albreda and took up their position around the Seyfu. A great many dances were performed to the accompaniment of music played on drums and reed instruments. When at last the dances were ended the Captain was presented with an embarrassing number of gifts. It was a strange sight, Commander Jenks sitting rather self-consciously in his neat white tropical kit surrounded by a crowd of colourful Africans interspersed with the white-clad sailors, while boys, old men and girls carried in baskets of fruit and eggs, and live poultry tied by the legs, or led in goats and finally a huge grey bull. After the bull came two fine young girls, lightly clad and bearing no gifts, but walking boldly towards the Captain while the Seyfu held out his hand in a gesture towards them. Commander Jenks' embarrassment overcame him and he rose, turned and started to thank the Chief, while the girls hesitated, looked baffled, and suddenly fled into the crowd of onlookers. No one onboard ever really knew whether or not these girls were to have been the final gift.

On Christmas Eve the Seyfu of Lower Niumi was appropriately in a giving mood and the ship called again at Essau to receive a fine cow.

The idea of an attack on Dakar from Gambia was never far from the planners' minds at this time. Aerial reconnaissance showed a deal of open parkland north of the Gambia River in

French Senegal, the boundary of which lay little more than five miles from the river bank in many places upstream.

However, it was only in a few places that it would be possible to land troops on the north bank and these must be investigated before any plan to attack Senegal from inland was developed. Native hearsay indicated a number of small landing places which might be suitable between Albreda and Kuntaur, a township about 150 miles upstream.

In 1826 Captain Owen, during his famous four-year survey of the coast of Africa, had sent his nephew up the Gambia River as far as Kuntaur and his chart was the only existing information in 1941. Much could have changed in the past 100 years. So *Challenger* was ordered to survey the river up to the limit of navigation and at the same time to carry out inspections of the landing places on the north bank, said to exist at Salekine Point, Mendora Creek, Kasban Creek, Devil Point, Bombale Kaua and Nianmaru.

This expedition would serve a double purpose as the ship was by now heavily covered with growth below the water-line and her speed was down to 7½ knots when steaming at her normal revolutions, instead of 10. *Challenger* would require 12 knots steaming at full speed if she was to keep up with the convoy when she set out for England again. Commander Jenks believed that if he spent a week at Kuntaur in the fresh water the ship would shake off the heavy growth which had accumulated in the brackish water of the lower reaches of the river. In fact this proved to be the case.

Off Albreda there was a small island, composed mainly of the ruins of an old fort, and on this had been placed the furthest upstream triangulation station. St. James Island was to be the fixed point of departure for the long river survey. Here both echo sounding motor boats were lowered and took station 45 degrees on either bow of the ship, keeping their distance by maintaining a constant vertical sextant angle between the ship's masthead and her water-line. The ship streamed the taut wire and on every occasion on which she altered course a sinker was slid down the wire to anchor it on the turn. By steering gyro compass courses and using the taut wire distances the length and direction of each leg of the long, long traverse were obtained.

An African who had navigated these waters in small craft came to indicate the passages through the sandbanks which the ship followed, sometimes having as little as two feet of water beneath the keel, but often as many fathoms as she entered the deep water close off the downstream bank on the river bends.

Every half mile the taut wire measuring dial was read and a simple flag signal indicated to the boats that this was a fix so that they marked their echo sounding records accordingly, for both ship and boats were sounding continuously. On the bridge an officer was obtaining the width of the river at frequent intervals by using a light rangefinder, while cross bearings by the gyro compass were being used to intersect the position of any topographical feature. This was a 'running survey' and there was no time for mistakes and oversights as the little fleet pressed relentlessly on upstream. It was a blessed relief for those on the bridge when one of the landing sites was reached. The ship came to anchor, and while relief crews manned the boats to survey the approaches to the landings a quick meal was snatched onboard.

It took four days to reach Kuntaur, 122 miles from St. James Island, for there was thankfully no chance of furthering the work by night. At Kuntaur the ship came to anchor with barely room to swing, further up the Gambia River than any modern ocean-going steamship had been before.

And while the fresh water did its work cleansing the ship's bottom the surveyors took astrolabe sights ashore on New Year's Eve to fix the Kuntaur end of the long river traverse, and continued the drawing of the surveys of the lower river in order that copies could be left in Bathurst before the ship sailed for the United Kingdom.

The taut wire traverse from St. James Island was plotted on a sheet of drawing paper over 6 feet long, and the final position of the landing at Kuntaur differed less than half an inch on the paper from the position found for Kuntaur by astrolabe sights. Thus the traverse was satisfactorily closed, but the various landing places inspected during the passage up river were shallow and backed by mud and were of no use for landing transport or even infantry if they were to take many stores with them. They could not be recommended as beach-heads over which to pass a considerable military force.

PASSING THROUGH THE SUEZ CANAL

ANCHORED OFF MUSCAT

The headmen of Kuntaur had heard much of the great warship working in the river and were delighted to welcome her and demanded that they should be allowed to come onboard. *Challenger*'s reputation as a man of war was so well established in these parts, from hearsay carried upstream by canoe, that it was felt in the ship that something special must be done during the headmen's visit to uphold the reputation.

A member of a local trading firm brought the desired answer; he asked *Challenger* if she would demolish an old warehouse which stood in a state of decay beside the river bank a little downstream from where the ship was lying. This gave the Gunnery Officer an excellent idea. He arranged to send the Boatswain ashore to set demolition charges below the building on the day of the visit by the headmen. At a pre-arranged flag signal the Boatswain would light the time fuse behind the warehouse and make his retreat into the jungle. Just before the time fuse was due to ignite the demolition charges the ship's pom-pom crews would open fire on the building, and, if all went well, the small two-pounder shells would appear to demolish the warehouse with an incredible explosion.

The guns' crews were as tense at their posts as if the warehouse had indeed housed the enemy as the seconds ticked away on the Gunnery Officer's stop watch. A few yards behind, the headmen of Kuntaur watched with eagerness as 'Open Fire' was ordered and the two guns stuttered into action. The tracer bullets had hardly reached their target when there was a deafening explosion and the shed itself was completely obscured by smoke. The headmen began to talk excitedly, the guns' crews smiled at each other. It was only as the smoke drifted away revealing the warehouse much as it had stood for years that the smiles passed from the faces of the guns' crews and the Gunnery Officer hustled the headmen off to see the chartroom.

Returning to Bathurst, copies of the surveys were turned over to the local naval and military authorities, and copies also sent off to the Hydrographer in case *Challenger* should meet her end in the Atlantic, taking her valuable surveys down with her.

Despite the fact that the ship's bottom was now clean, *Challenger*'s best speed was not quite good enough for her to maintain her position in Convoy S.L. 98, which she had joined for the voyage home. She therefore asked permission of the Senior Officer of the 40th Escort Group escorting the convoy to 'make all plain sail', and this granted, she hoisted her fore and mainsails.

At sea in war-time the afternoon watch was often the most peaceful and the younger officers were usually on watch throughout the convoy and in the escorts. Finding time heavy on their hands their eyes would turn to the strange sight of *Challenger* with her well-filled sails and they would decide to send funny signals to her Officer of the Watch.—'I see the spirit of Nelson is not dead'—'Have you got your screw up?' But they little knew that it was a strict rule of Commander Jenks that he should see every signal that came into the ship, however paltry its import might be. At this time of day he would often be snatching much needed rest after a night shattered by the alarm gongs and illuminated by snowflake rockets. By the time the signal reached the cuddy this humour was definitely misplaced!

Fuelling at Londonderry, the ship passed north and east about and reached Sheerness, where she paid off her well-tried crew, who had served Commander Jenks throughout two years of hard surveying, and who had become welded into a great surveying team. They went on their hard-earned leave, their crocodile skins in their kitbags and a fine set of sailor's yarns from darkest Africa to tell in their homely 'local'.

Challenger was taken into Dockyard control for a major refit for further service overseas.

XI

The Eastern Fleet

THE railway carriage was old, the upholstery worn and threadbare, the pictures of spas and resorts had long since disappeared from their frames above the seats; a dubious drawing and a bawdy suggestion scrawled with untutored hand replaced them upon the exposed cardboard backing. Three Royal Marines—a sergeant and two corporals—sat in the compartment gazing out across the flat, featureless marshlands of the Isle of Sheppey, their kit in bags and suitcases stowed upon the racks and the empty seats before them. The train crawled across the forbidding landscape as dusk fell and the last light in the western sky turned the mudflats of the Medway to sheets of lead.

The Marines had had a busy day for they had been turned from civilians to members of this fine corps in eight hours, a process which normally takes as many months. They were the chart production staff of *Challenger* travelling to join her at Sheerness on her commissioning day, the 1st of May, 1942.

The ship was preparing to sail to join the Flag of the Commander-in-Chief, Eastern Fleet. She was to be employed in making surveys and charts of the bases and anchorages that the Fleet would occupy during the course of the fluctuating battle being fought in the Indian Ocean. To eliminate the delays that would be occasioned by sending each survey back to England for reproduction as charts, the ship had now been fitted with a flat-bed printing press. This same press had been used onboard the old surveying ship *Endeavour* for reproducing her surveys during the Dardanelles campaign in World War I.

Challenger was to produce her charts by a process of lithography adapted to the equipment which it had been found possible to fit into this already overcrowded ship. It was planned to draw each chart upon tracing paper, and then, by placing this against a specially coated zinc plate in a glass fronted vacuum frame exposed to an arc-light or the tropical sun, to transfer the image to the zinc.

The zinc is coated with an emulsion said to contain egg-yolk and is a pleasing pale yellow in colour. The light makes the emulsion exposed to it soluble in water while those parts covered by the design remain insoluble. The soluble parts can then be removed by washing and by a series of processes the plate can be made to take bitumen where the image is required and the plate is ready for use as a printing plate. The zinc plates are manufactured in suitable sizes for reproducing charts and are made with a distinct grain in their surface which retains moisture. This in turn repels greasy substances such as printer's inks; thus if the plate is moistened, ink rolled over it will adhere only to the bitumen-coated image. A piece of chart paper placed in pressure contact with the printing zinc can then be made to accept the image. The old proving press in *Challenger* did just this; the plate and the paper were placed face to face on the flat bed and by turning a handle a pressure roller was made to move across the press to transfer the image. The plate had to be inked up by hand after each copy of a chart was printed. There was little mechanical and nothing swift about the method.

The most suitable persons to operate this equipment were members of the civil staff at the Hydrographic Supplies Establishment at Taunton. Volunteers from this branch of the Hydrographic Department were not lacking and a lithographic draughtsman, a printer and a photographer had been selected for this duty in the ship. But what naval rank or rating should these men hold? Authority had searched for a precedent and found one at last in the Royal Marines who had, for some long forgotten purpose, employed a printer in their ranks. So the men from Taunton must become Marines, but time was short and they could only be spared for one day to make this startling transition.

Sergeant Crowford, tall and with a fighter pilot's moustache, was the draughtsman, cheery Cockney Laws was the printer, and Corporal Lyons the photographer. They felt more like over-harnessed and overladen beasts of burden when at last they reached the ship lying at her berth in Sheerness Dockyard. In their unfamiliar uniforms, webbing equipment and heavy field-boots they stumbled under their loads of kit. For were they not going overseas? The Royal Marines must be ready for anything from ceremonial parades to commando attacks in any climate from the tropics to the polar regions. Besides their bulging kitbags each carried a linen bag containing a white tropical helmet and catching on every projection as they made their way up the gangway to the ship.

All was last-minute bustle at Sheerness; the old well-seasoned surveying crew who had been with Commander Jenks in the Iceland and West African surveys were now scattered throughout a hundred ships of the Royal Navy. The new crew were curious as to their rôle in this ship armed with but two Oerlikon guns, which had now replaced the even more inadequate pom-poms.

The ship had been painted in camouflage, giving her a novel and unusual appearance, mattresses had been hung around the outside of the bridge to protect the personnel from attack from the air; new boats had been built to Captain Wyatt's specifications, modelled on the Labrador dories he had used when on that coast in *Challenger* years before; they were designed for landing survey teams through surf on the open coasts of the Indian Ocean. Still the boom and gaff for the spanker remained, for the Captain considered that his sails would be needed for that extra knot during the long ocean voyages which lay ahead.

The ship had been fitted with a new asdic set and a small outfit of depth charges. Lieutenant-Commander Robin Bill, short and dapper, was the new First Lieutenant and was to take the ship with her green crew to the famous anti-submarine working-up base at Tobermory where evolutions and drills at all hours of night and day were designed to 'shake down' the ship's company and weld them into a useful body. After that they were to go on to Heysham where Captain Wyatt was to take command of *Challenger* again and a trial survey, including the printing of the chart, was to be completed before sailing for the East.

On the long lonely voyage to the Cape the crew spoke of the unusual work ahead; they turned to the surveying recorders like Petty Officer Charles Long with his pleasant smile and quiet explanations or to Leading Seaman Jimmy Greenshields who knew that the finest thing they would find at the Cape was the brandy, for he dearly loved his run ashore.

There were many of the crew who were free with their advice to the Marines as to what to do at sea and what not to do. The Canteen Manager explained his theory that eggs should always be placed in a net at sea and hung from the deckhead as anywhere else in the mess they would get broken. Each night he set up his camp bed beneath his precious cargo, but finally the cord holding the net chafed through with the rolling of the ship and two dozen eggs fell upon the sleeper's face—like a scene from a custard pie film.

On the afternoon of Friday, 28th August, 1942, *Challenger* sailed into Table Bay and berthed alongside in the harbour beneath glorious Table Mountain. But she did not dally long here, for orders were awaiting her to go on to Kilindini to join the Fleet.

The British Eastern Fleet had at the beginning of April 1942 been composed of the aircraft carrier *Formidable* and two other aircraft carriers, *Warspite* and four old 'R' Class battleships, seven or eight cruisers and about twice that number of destroyers. These ships were based on Trincomalee in Ceylon, Colombo and Addu Atoll, a remote fleet anchorage on the equator south of Ceylon. Very heavy Japanese forces were at sea in the Bay of Bengal at this time, including a force of five aircraft carriers, four fast battleships, cruisers, destroyers and tankers; but it was not until this force had delivered heavy air attacks on Colombo and Trincomalee and had sunk the British cruisers *Dorsetshire* and *Cornwall* and the carrier *Hermes* by air attack that the size of the Japanese Fleet in the Indian Ocean was apparent. The old 'R' Class ships were slow and with low endurance, and until greater British forces were available it was reluctantly decided that the Fleet could not be based again in Ceylon. Meanwhile the Eastern Fleet established itself at Kilindini on the East Coast of Africa so that the vital sea route from Britain to the Middle East by way of the Cape would at least be protected.

Although the asdic apparatus was primarily developed as an anti-submarine device, relying on the returning echo of a sound impulse to detect and then range upon a submarine, the surveyor also uses it as a deep echo sounding machine. A baffle placed within the dome below the ship's hull directs the out-going sound vertically towards the sea-bed. By fitting an echo sounding recorder to the asdic receiving apparatus soundings to the greatest depths may be taken, as the sound signal emitted is a very much stronger one than that issuing from the normal sounding machine. For much of the long journey out to East Africa *Challenger* had been sounding with her asdic apparatus, for, despite the war, surveyors such as Captain Wyatt followed the tradition of the Surveying Service that no opportunity be lost of increasing man's knowledge of the depths of the oceans. Shortly before reaching Kilindini the asdic dome, the ear of the apparatus one might say, was struck from the bottom of the hull by the ship hitting some submerged object. The Captain's remarks when reporting this matter were as follows: 'Apart from the lack of submarine look-out involved by this loss, it was particularly annoying as it prevented my carrying out a line of soundings past Europa Island and various shoals in the Mozambique Channel.'

When the ship arrived in Kilindini nearly the whole Eastern Fleet was in harbour and the port was very congested. Captain Wyatt waited upon Admiral Sir James Somerville, the C.-in-C., and also upon the local Flag Officer. He discussed the surveys and the future use of the port as a Fleet base and decisions were reached with the officers on the various naval staffs as to what work should be taken in hand. Two surveys, each on a large scale, were to be made covering Port Kilindini and Port Reitz to allow the closest possible berthing of ships. A survey of the entrance was further desired on half the scale of the port surveys. The existing chart was not considered adequate for approaching the harbour from the eastward so a survey of a considerable area on a scale of 1/75,000 (1 inch to a mile) was planned to take in those features along the coast which would first be sighted by ships making a landfall; the sounding on this chart would have to be carried seaward for a distance of about 15 miles to embrace the whole of the mineswept channel approach.

The survey of the Port of Kilindini was completed in the first month. As in West Africa, the work was arduous indeed, and sandfly fever and the effects of long exposure to sun and glare brought about many cases of sickness. A daybreak start and an earlier finish to the day's work when the glare from the westerly sun was at its worst curbed the rising sick-list. The new crew were getting into the swing of things; camp parties were being detached to progress the triangulation here or to watch the tides there; the boats were away sounding and the ship herself was at work outside the harbour. At night the surveyors had an immense amount of work to ink in before they fell, wearied, into their bunks for the short night's sleep. But the pace of the survey did not constrain the Captain to lower his standards of ship cleanliness; the regular weekly rounds of the mess-decks were carried out and the upper deck was inspected on Sundays with the same attention to detail as he had shown when inspecting the ship on her West Indies commissions in those far-off peaceful pre-war years. The white of her hull, the yellow of her funnel and upperworks, were no more, but the Captain expected even a camouflaged vessel to be 'ship-shape and Bristol fashion'. A war-time habit of plastering the decks with lime to whiten them had replaced, in many ships with wooden decks, the age-old holystone, but only once did the Chief Bosun's Mate attempt this short-cut to cleanliness.

As one of H.M. ships comes to anchor the Union Jack is hoisted at the flagstaff on the forecastle head, the gangway is lowered and the lower booms to which the boats will be moored are swung out; all should happen in one synchronised movement as the first rumble of the anchor chain is heard. This was not always so in time of war but it certainly was so in *Challenger*. Despite a week's arduous work behind her, if the booms did not go out instantly as the ship let go her anchor, then she weighed and came into anchor again. Not only did she thus earn for herself a reputation as a 'tiddly' ship within the Fleet but the seniority of her captain was soon widely known.

It is the custom in the Service that when one of H.M. ships passes or is passed by another, the ship having the junior commanding officer pipes the 'Still' upon the boatswain's call and the crew stand to attention. The 'Still' is then piped in the senior ship, followed a minute or so later by the 'Carry On', when the junior ship may then do likewise. Captain Wyatt was by now a very senior captain in the Navy List. One day a cruiser coming in from seaward passed *Challenger* working at the harbour entrance; it never crossed the mind of the cruiser's captain or the members of his signals staff that such a small craft could be senior to their own great ship, and no piping took place in either vessel. Without further thought the cruiser's captain sent a sharp signal admonishing *Challenger* for her failure to pay the traditional marks of respect, but he received an even sharper signal in return, drawing his attention to the Navy List.

One day Captain Wyatt, who was reconnoitring onshore for the scheme of triangulation, came to a 100-foot high water tower situated in a sisal plantation. Thinking that this would make a good position for a triangulation station he climbed the fixed ladder to the top of the tank where he began to make notes of what he could see from this vantage point. He noticed bees swarming round the top of a vent pipe on the tank and soon one of these stung him. He killed it and was at once attacked by the whole swarm. He beat a retreat down the ladder and ran through the plantation to a house about a quarter of a mile away. The good people let him in and plucked 30 stings from his head alone and dozens of others from his arms and legs.

Swollen-faced in the wardroom that night he asked if anyone was game for a go at making a theodolite station on the tank. Sub-Lieutenant J. E. Moore said that he had kept bees and was willing; so next morning he and the Doctor set off with a Flit-gun filled with chloroform and a mail-bag. They doped the bees inside the vent pipe and tied the bag over the end, and returned to the ship to report that all was ready for observing. Next day the Sub-Lieutenant climbed the water tower confidently, his theodolite on his back. But he had reckoned without the keeper of the sisal plantation; the wild bees were this man's tribal totem and he had removed the mail-bag so that the entire swarm was ready for the Sub as he reached the top of the tank. When he got back to the ship some hours later his head was in a bandage and his arm in a sling.

Shortly after this incident the Sub volunteered and was accepted for service in submarines; perhaps he thought enemy depth charges preferable to African wild bees.

Those in the field had worked hard, but now the Royal Marines were also busy. The chart of the Port of Kilindini was too large for *Challenger*'s printing outfit, so that it had to be produced in two halves, and two plates had to be made. After many difficulties due to the high temperatures and the humidity of the atmosphere both plates were ready on the 22nd November, only 12 days after the survey was completed.

The Wardroom ante-room had been taken over ruthlessly during the refit for use as a printing office and there were sinks, vacuum frames, arc-lamps and a whirler for coating the plates all packed into this small compartment. This left no room for the press itself, which had been fitted on the upper deck, close forward of the Captain's cabin; when in use a canvas tent was rigged around the press.

The day temperatures were far too high and fluctuating to permit good printing, for the inks became too liquid and spread over the surface of the zinc, so all-night printing was ordered.

The ship of course was darkened, and no glimmer of light must emerge from the printing tent. Inside, stripped to the waist, were Corporal Laws and a seaman from the duty watch. Laws was rolling up the printing plate time and time again with the hand roller like a pastry cook, while his seaman assistant turned the handle of the press at required intervals like a housewife at her mangle. The hours of the night slid by, the thudding of the printer's roller, the creak of the press and the murmur of conversation between the two men a background to the light sleep of the Captain in his bunk only a few feet away through the open square port. Any pause in this rhythm would awaken him and he would come out to the printers' shelter in his pyjamas and bedroom slippers to see what the hold-up might be. Perhaps it was a brief pause for tea, but more often it was a halt to clear the hand roller, the ink-slab and the printing zinc, which had all become hopelessly covered by invasions of flying beetles which were struggling in the morass of sticky printer's ink.

After seven days 56 copies of Eastern Fleet Chart No. 1 had been printed and as each chart had to be printed in two halves there was also the difficult job of joining them together. Paper is very sensitive to differing temperatures and soon absorbs moisture in a damp tropical atmosphere. This makes the paper change its shape by contracting or expanding, and it often became necessary to dry out the two halves of the chart in the baker's oven in the ship's galley before they would fit exactly together.

Printing under all these difficulties meant that some copies of the chart were better than others but there was always a keen demand for the new charts in the Fleet. The King's Harbour-master, whose job it is to organise the running of a naval harbour and arrange the berthing of the ships, had an insatiable appetite for the charts and every time a sub-standard chart came off the press it was placed on what became known as the 'Harbour-master's pile'.

E.F. 2, Manza Bay, surveyed by Lieutenant-Commander Cole, R.N.R. before *Challenger*'s arrival, was next printed, and this also required two printings, for a land tint was inserted in the second printing and added greatly to the appearance of the chart, although it was a difficult job, with the paper constantly altering its shape, to make a good registration on the second printing so that the land tint would fit exactly along the coastline in the original print. So much had the printing technique now been improved by experience of the difficulties onboard that the 60 copies of E.F. 2 were completed in two nights' work.

However, with the temperatures as they were in Mombasa at this time, the difficulties of coating the plates in the whirler were found to be almost insuperable, the only alternative being for Sergeant Crowford, the lithographic draughtsman, to draw the printing zinc completely by hand. So for E.F. 3, Port Mombasa and Approaches to Kilindini, a zinc plate was sensitised with a weak solution of nitric acid and alum and then, bit by bit, day and night, Crowford drew on the plate with a brush and lithographic ink the complete details of the chart. On a flat bed printing press the printing image on the zinc must be reversed as the contact between the chart paper and the plate is direct; so every sounding and every letter in this chart had to be drawn back to front.

On 5th January 1943, 60 days after the start of the survey of Port Mombasa, 125 copies of E.F. 3 had been printed from the direct drawing on the plate made by Crowford. This, despite all climatic difficulties, was war-time surveying as it should be done, and Captain Wyatt and his surveyors were pleased with their progress. Then E.F. 4, Approaches to Mombasa, was drawn direct on to zinc, which took only 15 days.

In 4¼ months since the ship arrived in Kilindini she had completed four detailed surveys and produced five charts in quantity sufficient to meet the immediate needs of the Eastern Fleet. Orders to sail for a refit in Cape Town were received with jubilation onboard. The following letter from the Flag Officer, East Africa, speeded *Challenger* on her way to the Cape.

Office of the Flag Officer
East Africa
Royal Naval Base, Kilindini.

The Commanding Officer,
H.M.S. CHALLENGER.

> On your leaving Kilindini I wish to express to you, and the Officers and Men serving under you, my appreciation of the work carried out by H.M.S. *Challenger* during recent months.
>
> 2.—The survey work carried out during this period will be of the utmost value to ships of the Eastern Fleet, and the expeditious manner in which so many charts have been produced is worthy of the highest praise.
>
> 3.—I hope that your forthcoming refit period will provide an opportunity for Officers and Men to take leave which has been well earned.
>
> 4.—The numerous survey marks in the vicinity of Kilindini Harbour will probably remain a constant memorial to your activities.

C. Stuart,
Rear Admiral.

A few were left behind under Lieutenant Gordon to form the Kilindini Surveying Unit, for dredging and the building of new wharves would necessitate many corrections to the E.F. charts as time went by. (General Gordon was once again serving in *Challenger*, in which ship he finally spent seven years of his life as a naval surveyor.)

There had been frequent U-boat scares when on these lone voyages and while the ship was steaming down from Kilindini to the Cape the Commander-in-Chief attempted to divert her as, according to sinking reports, she was sailing right into a pack of submarines; but this diversion signal never reached *Challenger* who at that very moment was busily attacking a whale which she had located with her asdic gear and had mistaken for a U-boat.

Later she passed right through the centre of a cyclone in the southern end of the Mozambique Channel. It was late at night and the trucks of both masts and yardarms were sizzling with St. Elmo's fire. There was no wind at the cyclone's centre but the ship rolled drunkenly in the huge confused seas which came at her from all directions. Suddenly the wind rose again and with a swishing sound the lashings at the bottom of the protective mattresses outside the bridge parted and the mattresses flew up and inboard on the bridge like leaves of a calendar, narrowly missing those huddled on the bridge, and making a noise like a clap of thunder.

The mattresses were pushed outboard but flew in again with renewed ferocity, first one side and then the other. The anemometer, which normally emits buzzes at diminishing intervals as the wind rises, was now making a continual noise indicating that the winds were not far short of 100 knots. But the ship came through unscathed, and reached Cape Town in good order.

The hospitality of the good people of the Cape is too well known by every serviceman who passed that way during the war for a further description to be given here. No better place could have been found for the ship's company to relax while their ship was being repaired. Miss Lucy Bean was in charge of the hospitality, and she had a delightful home planned for every member of the crew when his leave became due. Men were asked whether they preferred rural or city life and their hosts were chosen accordingly.

Information was already coming in from the Kilindini Survey Unit about new buoys and navigational beacons and many other changes taking place at Mombasa, which meant correcting the plates of the E.F. charts and printing new editions to be packed and sent off to the Chart Depot at Kilindini. So the Royal Marines could not take their leave until all this work was behind them. But daytime printing was possible in this cooler climate and they were able to spend many a long night in the famous Del Monico, drinking beer and listening to the orchestra under the domed and star-studded ceiling.

The zinc plates were now getting worn smooth and the important moisture-retaining grain had to be re-imposed. This is done by putting the zinc in a trough full of marbles which is then agitated mechanically. The constant rolling of the marbles this way and that imposes the grained surface. No apparatus of this nature was carried in the ship but the Marines found one in the printing offices of the *Cape Times* and approached the Manager. He was delighted to help them in this matter, more particularly as his ambition at that time was to be invited onboard a naval ship. The Marines said that they would arrange for the Captain to invite him onboard for luncheon. This had seemed easy at the time, but somehow the Marines never plucked up the necessary courage to tell the Captain that they had issued an invitation on his behalf.

By the time the refit was completed at Cape Town in April 1943 the tide of war was turning in the Indian Ocean and the Japanese Fleet were never again to range freely in these waters. The naval base at Trincomalee was coming into its own as the land forces moved into Burma and our naval forces moved eastwards in support.

So when the ship sailed from the Cape only a brief visit was paid to Kilindini, to collect the Survey Unit which had been left there, before she sailed onwards across the Indian Ocean, and in early May she was surveying in the Palk Straits between India and Ceylon. Preparations were already being made for the Allied invasions which were eventually to take place in Burma and Malaya; the first requirements for large-scale combined operations are spacious anchorages in which the convoys can assemble, and well-surveyed sea training grounds where the combined operations exercises may be carried out in realistic conditions without endangering the numerous craft taking part. Such exercises will include bombardments and the landing of troops over beaches. Charts of such remote and spacious locations are unlikely to exist on anything like a large enough scale for these purposes; such areas must first of all be selected and then surveyed and operational charts prepared at an early stage.

The surveys in the Palk Straits were followed by a visit to the Seychelles, the incredibly beautiful group of islands which forms the British Crown Colony far out in the Indian Ocean. It was to be used as a fleet oiling base and it was required to survey three approach channels across the reef plateau upon which the islands stand. On 25th June the ship anchored off Port Victoria, the capital, situated on the island of Mahé, and a triangulation scheme for the Seychelles group of islands was being vigorously planned.

A month later Captain Wyatt left the ship to travel to Colombo to discuss with the Commander-in-Chief the future hydrographic organisation of the Eastern Fleet Command. Great moves by the

Fleet were now being planned, and as well as surveys to be made there was an expansive programme of operational charts to be produced and the re-printing of existing charts on the Station, for to send to England for every chart requirement at this stage meant endless delays. Although *Challenger*, with sufficient small craft acting as tenders, would probably be able to handle the surveying side of the work, her small press was quite inadequate for the chart printing requirements which were now growing day by day. What was now wanted was a shore organisation to cope with the printing, distribution and correction of locally produced charts. Captain Wyatt was the Fleet Hydrographic Officer and he was ordered to prepare such an organisation which would serve the Fleet as the war crept down the Straits of Malacca and into the China Sea.

How Captain Wyatt organised the Hydrographic Office in Colombo and arranged for the printing of chart maps by the Survey of India and the Survey of Ceylon and how he set up a Chart Production Unit working first at Dehra Dun and later at Kandy is not really the story of *Challenger*. But from now on his attentions were divided between his Colombo office and the ship, which carried on under her temporary captain, Lieutenant-Commander Bill, during his long periods of absence. Some of *Challenger*'s men, including Petty Officer Long and the Royal Marines, were landed to assist with the production work which was now carried on with the more modern equipment available there, while the faithful old flat-bed press lay shrouded in canvas covers and forgotten on the ship's forecastle.

The work in the Seychelles had been going forward steadily, with brief periods for recreation ashore in Mahé, where the officers and men were welcomed by the friendly people. Cricket matches became a weekly feature of life, after which iced beer was served from the pavilion. The prisoners from the gaol were usually there and watched the matches although they were supposed to be cutting the long grass around the field, but there was a war-time shortage of warders and they were in charge of a charming rascal who was himself a prisoner, but who used to sit and drink beer with the sailors.

One evening, when the work for the day had been completed onboard, a sing-song developed in the wardroom, the songs getting louder and bawdier as the evening progressed. No news of Captain Wyatt's return had been received and it was a surprise to the coxswain of the boat which went inshore at 10.30 p.m to pick up the libertymen to see his Captain, who had just arrived from Colombo by flying boat, pacing up and down the jetty awaiting a passage off to the ship.

As the coxswain brought the boat alongside the gangway of the ship the sound of a well-known naval song issued from the wardroom portholes where every singer was trying to outdo the next. To the amazement of the Officer of the Day the Captain came up the ladder from the boat, and even before the coxswain had shoved off from the gangway he heard the song cease with a startling suddenness and silence reign.

One day when Lieutenant-Commander Tripp was ship sounding off Seychelles he saw to his horror the brown, ominous shape of a dangerous rock only a few feet below the surface and a few yards from the bows. As he watched aghast the pinnacle of rock passed down the port side. What could he do? Guy Wyatt, who happened to be on the bridge at the time, soon told him. 'Fix, man!' said he.

A month later the work in the Seychelles was completed as far as it was now desired to carry it, and *Challenger* sailed northeastwards. She called briefly at the lonely atoll of Fadiffolu to appraise its value as a Fleet anchorage, but in haste as he was, the Captain found time to run a line of soundings through and away from the atoll on the other side, fixing his position with reference to the centre of the atoll by running taut wire. In this manner he obtained an excellent profile across an atoll, that strange coral structure which rises so abruptly from the depths of the true oceans.

Challenger had always sailed alone in the Indian Ocean, for she was really too slow for the ocean convoys. Her armament of two Oerlikon guns was quite inadequate for these long, lonely voyages; true, the First Lieutenant had rigged a most convincing looking gun on the forecastle using canvas for the gunshield and a beacon pole for the 4-inch barrel, but once that bluff was called there would be little left with which to fight a well-armed submarine or raider, and *Challenger*'s speed would not help her escape.

Above: SHEIKH KHAMIS BIN HILAL APPROACHES WITH HIS 'ARMY'

Below: COMMANDER BAKER WITH SHEIKH KHAMIS BIN HILAL AND HIS BROTHERS

Photo: Lieutenant G. P. D. Hall, R.N.

ANCHORED ALONE AT THE HEAD OF HVALFJORD, JUNE 1940

About half an hour after daybreak on the day following her departure from Fadiffolu, and when the Captain had just gone down to have his morning bath, a submarine was sighted on the horizon. The Captain rushed to the bridge with only his bath-towel about his waist, and even this was in imminent danger of slipping off. He sized up the situation: with no guns larger than Oerlikons and the low speed available there was no hope of a successful action, and all that could be hoped for was that the submarine would see the mock gun on *Challenger*'s forecastle and reach a similar decision. All eyes were on the low, ominous, distant shape. The minutes ticked by and the submarine made no move to close the range. For a whole hour the ship's company awaited the attack that never came. When the masthead look-out had at last lost sight of the submarine the Captain made a large alteration of course and broke W/T silence to report. On arrival at Colombo, it was learned that the submarine was a British one.

The First Lieutenant's gun must have been very realistic, however, for one of the first persons to visit the ship on her arrival was the Port Gunnery Officer who had been passing the ship and had come onboard to inspect the 4-inch gun which he saw she carried.

One day the Fleet Royal Marine Officer passed a Sergeant and Corporal of Marines in a Colombo street. There was something unusual in their salute which drew his attention to them and he called them over. They had never had one day's training since that first day in the barracks at Chatham and it was an easy task for the officer to find faults with their uniforms and the way they were wearing them. He questioned them as to their unit and said that in all his days as a Royal Marine Officer he had never seen two such unorthodox Marines. They would be called in for guard and drill duties forthwith. Captain Wyatt got wind of this painful interview and saw that unless he acted swiftly he would lose his lithographic draughtsman and his printer. Consequently he sent for the Fleet Royal Marine Officer and the two Marines were spared the guard duties which they had not been relishing.

Two more sounding boats were on their way out from England, and a motor launch was allocated for survey duties. Extra men were recruited from the Fleet for training in *Challenger* to man these craft. By now the ship was at Trincomalee, where there were floating dock berths, dredged areas and anchorages to be sounded.

At the end of 1943 the British XV Corps held Cox's Bazaar on the Arakan coast and a survey to locate the channel over the bar was required to admit supply vessels to that port. The enemy was close at hand and it was decided that a detached party should be sent from *Challenger* to do this work, taking with them one of the ship's echo sounding launches.

Volunteers for this expedition were quick to come forward from the ship's company once they heard that Charles Grattan was to be their leader, for he had earned a fine reputation for cool deliberation in such enterprises. Leading Seaman Jimmy Greenshields was to be the surveying recorder and second-in-command of the small party of five ratings.

They left Trincomalee in November 1943, sailing with their boat to Chittagong in a merchant ship. On arrival there Grattan did some hard talking before he found himself in possession of a base ship. She was the old river steamer *Esther*, her captain a British Army sergeant and her crew twenty Indians, one of whom was a cook who could disguise corned beef a hundred different ways.

Things went smoothly, there was no interference by the Japanese and the channel was surveyed and marked within a week. Fast going, and Lieutenant Grattan flew direct to Delhi with his work, there to have it printed as a chart.

On 19th January, 1944, the British 5th Division commenced an advance southwards along the coast and Tek Naaf, on the western bank of the Naaf River, was occupied. A small bridgehead was also established on the eastern bank but the Japanese continued to hold the remainder of that bank, and the coast southwards from the river mouth. The Naaf River flows southwards parallel to the coast and but a few miles inland from it. Inside the river was deep and easily navigated, but to enter it supply vessels would have to thread their way along the shifting channel through the breakers and shallows of the Cypress Sands, which stretched five miles to seaward.

This channel had to be located and marked and Grattan's party moved forward nearer the enemy. Escorted by a motor launch of the Royal Indian Navy, the survey boat steamed from Cox's Bazaar southwards 50 miles through the night to St. Martin's Island, which lay close south of the Naaf River entrance and five miles off the enemy-held coast.

Luckily there were no Japanese on St. Martin's Island, only a few Burmese, and Grattan took possession quietly, anchoring his boat off the casuarina lined shores and taking over a native hut for his headquarters. No lights or fires were permitted on the island by night, whilst the sky to the eastward was illuminated by the flash of artillery and falling bombs.

Close as the surveyors were to the enemy, the base had to be measured with the usual care, and this was done on a low sandy spit at the west side of the river entrance. Then the triangulation had to be observed, which meant landing by day on the enemy's shore. Sometimes Zero fighters flew so low over the party that they could plainly see the pilot in his cockpit, and they were happy to think they may have been mistaken for Japanese. Once ashore Charles Grattan used his theodolite and Jimmy Greenshields booked the angles; the other two members on shore stood guard with the entire armament, a stripped Lewis and a Tommy gun, peering fearfully into the thick jungle. But for some strange reason they were never discovered until they were once again in their boat and bullets sung past them as they made off; on one occasion they had only just left a Burmese village when the whole place went up in flames, presumably as a reprisal for the slight assistance that had been given to the surveyors by the villagers.

After about a week, when it seemed that the Japanese had overlooked the activity on St. Martin's Island, *Esther* arrived with her helpful captain, gifted cook and comfortable bunks. However, *Esther* did not distil her own water, nor was there any on the island, so that every two or three days she must sail at full speed, with all guns manned, into the river and upstream to a muddy pool on the western bank where fresh supplies were taken onboard.

The surveyors got to know every yard of the coast south of the river, and when the channel through the Cypress Sands had been surveyed and marked for shipping the little party were delighted to find themselves asked to guide in the commandos landing on the coast to make a right hook. Charles Grattan led the landing craft in a motor launch, while Jimmy Greenshields, happily commanding a massive American diesel craft, brought in the second wave, a fitting ending to the *Challenger*'s activities on the Arakan coast.

On 6th March the first large vessel, s.s. *Engby*, entered the river by the new channel and berthed at the military base at Tek Naaf.

Lieutenant Grattan received a Mention in Despatches for the fine work done by his team, and the Supreme Commander South-East Asia wrote to the Naval Commander-in-Chief as follows:

> My Dear Commander-in-Chief,
>
> I wish to express my deep appreciation of the splendid work recently carried out by the Naval Survey Party which surveyed the Naaf River Entrance.
>
> By locating and charting a deep water channel the Survey Party has made it possible during the monsoon season for seagoing ships to enter the Naaf River and reach Maungdaw. The alternative, if no action had been taken to locate the channel, would have been for vessels to discharge at Cox's Bazaar and for stores to proceed from there by road, thus placing a great additional burden on Road Transport during the difficult monsoon season.
>
> I shall be glad if the Officers and Men of the Survey Party can be informed of the great value their work has been to the soldiers fighting in the Arakan.
>
> (*Signed*) Yours sincerely,
>
> Louis Mountbatten.

On Christmas Day, 1943, Captain Wyatt was once again in *Challenger* on his way to Palk Strait to take in hand more surveys of that area, which was required for use as operational training grounds. The area entailed over 300 square miles of sounding. Much of it was out of sight of land so that a triangulation scheme had to be established using moored beacons, instead of the usual landmarks, connected to the shore survey. This work was completed between the 5th and 25th January, 1944. The surveyed area was tinted in red on the existing small-scale chart of the area and forwarded to the C.-in-C. to show him what good progress was being made; his comment was that it did not look much for three weeks' work!

About this time the strategic importance of the Cocos-Keeling Islands was realised, lying as they did utterly alone in the Indian Ocean, about 600 miles from the Japanese-occupied territory of Sumatra.

It was planned to survey the islands, the lagoons and the reefs with a view to using the anchorages and laying down an airfield. A party was assembled for this purpose at Colombo and consisted of Lieutenant E. E. Croome from *Challenger* with a Petty Officer Surveying Recorder, and three A.B.s to do the hydrographic survey; there were also Royal Engineers and a Flight Lieutenant to site the airfield. The party sailed in a fast minelayer, complete with every item from Bren guns to tin-openers. They were to be left some weeks on Cocos and it was by no means certain that they would not be visited by the Japanese during the period. To make their presence less conspicuous from the air they took no survey boat but relied on 'local resources', a familiar and dreaded term to the ears of any hydrographic surveyor.

It was upon these atolls that Mr. Darwin wandered with Captain FitzRoy from the British naval survey ship *Beagle* in 1842 and pondered upon the construction of these low islands lying around a shallow lagoon; whilst outside the lagoon Captain FitzRoy had showed by his lead line soundings that the bottom fell away precipitously to very great depths which he could not plumb.

Darwin and FitzRoy had met Captain Ross, who had settled in the islands about 1835 with his family and a former ship's mate who had served with him. Soon Ross was employing as free labour the Malay slaves whom a Mr. Hare had imported a few years before. The islands have remained in the Ross family ever since and the descendants of these Malay slaves are the inhabitants of Cocos-Keeling today. The surveyors found the natives leading an orderly and pleasant life, and despite the lack of outside provisions and many articles of daily use, due to their remote position and war-time difficulties, their standard of living appeared to be above that of many dwellers in the East, based as it was upon coconuts and pigs.

Almost on arrival Croome's crew went sick with some form of dysentery and he had to search the village alone for a boat and a Malay crew to man her. The craft he finally found was a hard chine boat, with a high freeboard and an unpredictable engine. In this he went to sea for the hydrographic survey, first within the lagoon, then through the entrance channel and along the outside of the wave-battered reef. A Malay steered while his companion coaxed the engine and a very brave and seasick R.E.

Sergeant, who had come as the geologist of the team, struggled alongside Croome to take sextant angles with the unfamiliar instrument as the boat bobbed like a cork or drifted broadside with the wind. The Flight Lieutenant (Radar) wrote down the angles and recorded the leadline soundings being taken by the two A.B.s who still remained on their feet. The Major (Airfield Siting) was pressed into service to record the rate of tidal streams through the entrance channel of the lagoon, anchored there in a native canoe.

There were one or two occasions when the engine broke down while they were working outside the reef; luckily the wind was blowing towards the reef, or the craft and its oddly assorted crew would have been borne away to the middle of the Indian Ocean. So steep were the sides of the reef that the anchor failed to hold the boat until she lay pitching and plunging a few feet from the breakers pounding upon the edge of the reef itself. There, in this perilous position, praying that the anchor might continue to hold, the surveyors remained while the Malay engineman coaxed his unwilling charge into action again.

On returning to Ceylon Croome handed in his completed survey. He was quite worn out with improvising and was happy to be back. The bill for the hire of his boat at Cocos and the crew that went with it came to about £200, and this was paid without comment by the Naval Supply Staff, but a few days later Croome received a bill for 14*s*. 3*d*. in respect of crockery he had failed to bring back with him from those distant isles.

In April the approaches to the Naval Base at Trincomalee were taken in hand for survey with H.M. Yacht *Nguva*, Motor Launch No. 1248 assisting. Eastern Fleet charts had now reached well over twenty in number. These, like all charts, need constant revision and correction and Notices to Mariners had to be established to correct them. The Admiralty Notices to Mariners have been published for many years and go forth weekly to all holders of folios of Admiralty charts, bearing the corrections which Mariners should make to keep them up to date. Local Notices to Mariners supplied by the Hydrographic Office at Colombo carried to users of the E.F. Charts such corrections as became necessary week by week and the first copies of these notices were printed by Petty Officer Long on a Gestetner duplicating machine in early May 1944.

By the end of June the shore Hydrographic organisation was well established. The Admiralty had taken over a large yacht in England called the *White Bear*, which was being fitted out with the latest in chart printing and production apparatus, and she was shortly to sail to become the hydrographic vessel with the Eastern Fleet. Captain Wyatt, although still the Fleet Hydrographic Officer, was now able to return to his ship and to sail in her for Sydney, where she was to undergo a refit which was well overdue, and where she arrived on 26th July.

XII

Torres Straits

In 1606 a Spanish Expedition which had set out from Peru under Quiros was in the South-West Pacific. The ships became separated and eventually one of these, commanded by Luis Vaez de Torres, passed through a reef-encumbered passage between that part of Australia now known as the Cape York Peninsula, and New Guinea. The second European to pass through these straits was Captain Cook, who landed with Mr. Banks upon a small island which he described as 'mostly barren rock frequented by birds such as boobies'. It was as he returned to the ship on this occasion that he noticed the south-westerly swell and realised that he was now 'westward of Carpentaria' and that he had passed through Torres' strait. Cook named this bare island 'Booby Island'.

In 1944 the thoughts of both the British and the U.S. Navies turned upon Torres Straits. The remaining passages between the Indian and the Pacific Oceans were closed by the Japanese and there was no other way open except by the long passage right round the south of the Australian Continent. It might be necessary at any time, as strategy required, to pass battleships and aircraft carriers rapidly from one of these two oceans to the other. More particularly at this time was it likely that the British Eastern Fleet might be required to move rapidly to the Pacific from the Indian Ocean to join the U.S. Fleet.

A navigable channel through Torres Strait had been surveyed by Captain Blackwood in the survey ship *Fly* in the years 1843 to 1845, and it was his charts which were now investigated. His channel was well used, lighthouses now marking some of the vital turning points along the tortuous route. The channel throughout its entire length of 100 miles from Booby Island in the west to Dalrymple Island in the east seldom exceeds 100 feet in depth and so it may be seen what a potential danger an undiscovered coral head might be to a fleet of ships requiring a depth of water of 35 feet. Away from the channel itself the reefs still remain practically uncharted. Such remarks as are still on the chart—'Reef seen by Mr. Ashmore in 1811 (not surveyed)' and '*Fly* entered here (dangerous)'—do not inspire confidence.

Much more recently Lieutenant-Commander Karl Oom, R.A.N., who had served in *Challenger* in Labrador, had completed a survey of the western end of the channel and H.M. Australian Ships *Moresby* and *Vigilant* had sounded and swept a portion of the Great North East Channel; two former *Challenger* officers were also serving in these ships, 'Tancred Pass' and 'Lowry Islet' bearing witness to their efforts.

It was now decided to sweep the entire channel for obstructions and widen it wherever possible, the survey to be given utmost priority.

Challenger's Captain was placed in command of Task Unit 70.5.2. under the operational control of the Commander U.S. 7th Fleet. The Unit consisted of the ship herself, the Royal Australian Naval Trawlers *Goolgwai*, *Samuel Benbow* and *Durraween*, two seine net fishing vessels, *Polaris* and *Winter*, and a motor launch. All these vessels were fitted with echo sounding equipment and an assortment of sweeping gear.

Lieutenant-Commander R. T. Tripp and General Gordon were posted from *Challenger* to the *Goolgwai* and *Samuel Benbow* respectively, and these two ships, forming the advance guard of this strangely assorted unit, sailed from Sydney for Torres Straits on 13th September, 1944. *Challenger* was to hasten after them in early October at the conclusion of her refit.

Captain Wyatt had time only to see this operation getting under way before his orders came to return to England. In the following year he was to take over as Hydrographer of the Navy from Vice-Admiral Sir John Edgell. This meant that he had reached the highest post it is possible for a naval surveyor to hold, but in spite of this knowledge it was a sad day for Captain Wyatt when he had to leave *Challenger* knowing that she was his last sea-going command. He had always been a man of the sea. He loved the ship and her company and there were tears in his eyes when he said good-bye. He was going, he told the men, to become a 'nine o'clock sailor', and so the First Lieutenant, Bill, took over command of the ship.

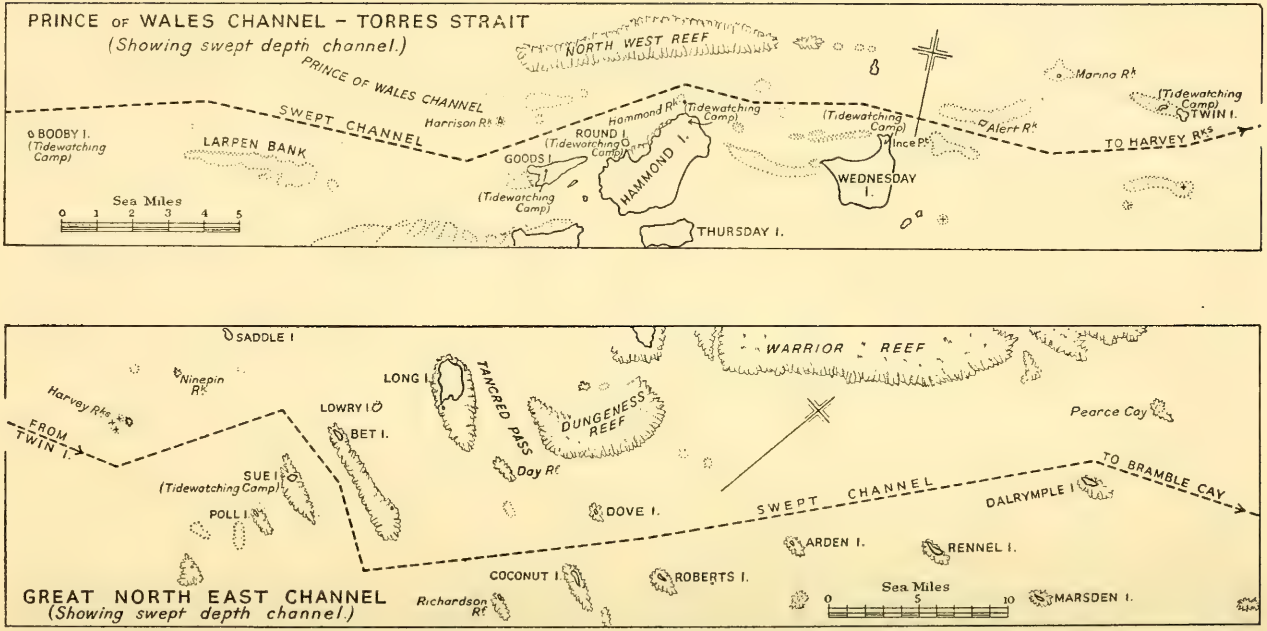
Challenger and the trawlers were fitted with gear called the Oropesa sweep, normally used for the sweeping of moored mines, but also used by surveyors to sweep for obstructions at various depths below the surface of the sea. The merit of the apparatus is that by means of steel 'otter boards' the sweep runs out to port and to starboard of the sweeping vessel at a set depth and thus the ship does not need a partner to sweep a wide swathe of the channel. *Challenger* worked in the somewhat deeper water to the eastward using this gear, but so shallow was the water of the Prince of Wales Channel in which the trawlers were sweeping that the otter boards themselves, which hang five or six feet below the sweep wire, were fouling the bottom. So the trawlers worked in pairs, dragging a chain bottom sweep between them. This could not be done however where the sea-bed was rough and so in such areas a wire sweep was rigged between two vessels. The light wire used for the sweep is held down below the stern of each ship by passing it through a block secured to a heavy weight suspended from the stern of the sweeping craft. Wires with floats attached to them are secured at intervals along the sweep to keep the whole 1000 feet of sweep wire at the correct set depth. Such work had to be taken very slowly: the vessels did not sweep at random, for in one of these craft, each swathe cleared was plotted upon the sounding boards by a surveyor who repeatedly fixed his own ship by reference to the survey marks which *Challenger* had now erected and co-ordinated on the numerous small islands and reefs along both sides of the channel. The second trawler maintained its careful distance of 1000 feet from the fixing vessel. Thus was the progress of the work recorded day by day and gaps in the sweeping filled.

Challenger's work consisted of the erecting and fixing of the marks, the sounding out of the more intricate parts of the straits with her echo sounding boats in order to locate the deepest passages, and, together with the Royal Australian Naval minesweeper *Echuca*, which had now joined the Task Unit, sweeping the North-East Channel with Oropesa gear. Each time this equipment fouled an obstruction the ships would have to be hauled back and every effort made to salve as much of the sweep gear as possible. There were many obstructions and the supply of sweep gear arriving at Thursday Island barely kept pace with these unavoidable losses. Each time an obstruction was thus located it had to be fixed and a search with the echo sounding boats made to find the shortest way around it.

Soundings on charts show the depth of water the mariner can expect at Spring Low Water, being as low as the tide is likely to fall. Whenever the surveyor is sounding therefore he must have a tidepole erected so that every sounding may be corrected to the height of the tide above sounding level (or 'datum') before it is inked in upon the sounding boards to become part of the future chart.

The height of the established level ashore above sounding datum is recorded, together with a full description of the fixed mark which establishes the level; this mark is known to the surveyor as a 'benchmark', formerly 'bankmark', then being a mark cut in the bank of a river so that flood waters might be gauged. If any future survey is undertaken in the same area at a later date a tidepole can be erected, and as soon as it is levelled down from the fixed mark the height of sounding datum can be established on the pole without the necessity of re-observing the rise and fall of the tide for the complete period of a lunar month.

So it is that in all the larger ports of the world benchmarks have been established. In many remote native villages or in sheltered coves and bays on uninhabited shores such a mark is known by the Hydrographic Department to exist and its description and height above sounding datum may be found in the records and supplied to the captain of a ship sailing to survey in the area. Every one of these benchmarks shows the site of a tidal camp where a small party of naval ratings has lived for at least a month to watch the rising and falling of the tide throughout the lunar cycle. Sometimes in recent years, sometimes well over 100 years ago, these simple men, by performing their tide-watching duties, have established a quantity of solid data for the study of the earth's tides. When recovering an old benchmark it is interesting to visualise the party of men who established it 50 years before, to see their camp and imagine them sitting with their clay pipes and sennit hats as they converse with their native neighbours in that form of pidgin English in which the sailor communicates freely with those of other tongues the world over. There are many


PRINCE OF WALES CHANNEL – TORRES STRAIT
(Showing swept depth channel.)
PRINCE OF WALES CHANNEL
SWEPT CHANNEL
NORTH WEST REEF
Harrison Rk
BOOBY I.
(Tidewatching Camp)
LARPEN BANK
Sea Miles
0
1
2
3
4
5
GOODS I.
(Tidewatching Camp)
ROUND I.
(Tidewatching Camp)
Hammond Rk
(Tidewatching Camp)
HAMMOND I.
THURSDAY I.
(Tidewatching Camp)
Ince Pt
WEDNESDAY I.
Alert Rk
Marina Rk
(Tidewatching Camp)
TWIN I.
TO HARVEY RKS
GREAT NORTH EAST CHANNEL
(Showing swept depth channel.)
SADDLE I
Ninepin Rk
Harvey Rks
FROM TWIN I.
LONG I.
LOWRY I
BET I.
TANCRED PASS
DUNGENESS REEF
Day Rf
SUE I
(Tidewatching Camp)
POLL I.
DOVE I.
COCONUT I.
Richardson Rf
ROBERTS I.
WARRIOR REEF
SWEPT CHANNEL
ARDEN I.
RENNEL I.
Sea Miles
0
5
10
MARSDEN I.
DALRYMPLE I
Pearce Cay
TO BRAMBLE CAY

Swept depth channels, Torres Strait

stories of tide-watchers who are left for long periods to their own resources, sometimes on uninhabited islands, sometimes in communities far from what the sailor would call civilisation. Before the days of radio they often had to nurse one of their fellows through malaria or other ailments or deal with snake bites and accidents; today the ship can be called in such emergencies.

A tide-watcher had been established in the Wyre Lighthouse to read a tidepole during the period when *Challenger* was surveying at Heysham at the beginning of the commission. This man was taken ill with severe stomach pains and a party from the ship arrived by boat at the lighthouse to collect him. It was necessary to lower him into the boat from the balcony of the lighthouse by placing him in a Neil-Robertson stretcher, which is supplied for just such a purpose. When secured inside this stretcher the patient is incapable of moving hand or foot. The tide-watcher, thus helpless, was being lifted over the parapet of the lighthouse by the rescue party when he slipped from their grasp and fell like a stone. The officer who was in charge caught a quick turn with the rope with which it had been planned to lower the man, and it was just in time, for the rope brought the stretcher up with a sickening jerk a few feet above the waiting boat. The lighthouse keeper was later heard to say that he had never seen such a fine feat of seamanship!

A complete new crew were now arriving at Thursday Island in dribs and drabs to relieve the men who had served a full commission in *Challenger*. Commander Sabine took command and with him came a number of surveying officers who were new to the old ship. Among these was a young lieutenant, John Thomson, and one of his first duties was to land on Cook's Booby Island to locate the benchmark established there in 1843 by the men of H.M.S. *Fly*. It was said to be cut in ironstone rock at the mouth of a cave known as the 'Post Office', which had been used as such in former times, vessels going eastwards leaving their mails in the cave for collection by vessels homeward bound. It was many years, however, since this pleasing idea had been abandoned, for even when the earlier *Challenger* visited the cave in 1875 there was only one letter there, and that was a treatise addressed 'to whom it may concern' describing the navigational difficulties of the Torres Strait as the master of the vessel *Banda* had found them. But although Thomson found no letters, he located the benchmark and saw the name of H.M.S. *Fly* beautifully carved upon the walls of the cave.

The tides of the Torres Straits are extremely complicated, for the strait connects two areas in which, as the Admiralty Tide Tables say, 'the tides differ remarkably'. Sometimes it is high water in one area when it is low water in the other, which causes strong tidal streams to rush from the higher level to the lower. *Challenger*, measuring the rate of these streams at frequent points along the channel, found them to flow at times at speeds up to eight knots, so that it can be imagined how difficult this made the dragging of the sweeps along the channel.

To find the tidal reductions hour by hour throughout each day so that the sweeps could be set to the required depths it was necessary to establish a whole chain of tide-watching camps, for the time of high and low water differed considerably along each leg of the route. Starting with a camp on Booby Island, parties were landed to make camp on Goods, Round and Hammond Islands, Ince Point, Twin and Sue Islands.

Round Island is small and covered with dry scrub. It is only about 400 yards across in any one direction, and this was one of the places where two men were to camp for a month to watch the tide-pole. A team from the ship helped to land their stores and to pitch their tents, and then with much talk about Robinson Crusoe and Man Friday the helpers manned their boat and headed out for the ship, waiting impatiently offshore. The two men were left in their own little kingdom, and after a brief look around they decided to fall back upon the sailors' stand-by and to make themselves a cup of tea while they thought of the long days ahead and what they would do when they were not actually reading the tidepole.

As Round Island was sinking below the horizon astern of the ship the Officer of the Watch happened to look back. A billowing cloud of smoke rose above the island; if atomic bombs had been known at this time it would have been assumed that this was one of them. The ship turned and made her best speed back to the island while those on the bridge looked anxiously through their binoculars to see what was happening. The whole island was furiously on fire, and no sign of camp or campers could be seen.

A boat was lowered and hurried in towards the beach where so recently the campers and their gear had been landed. As the boat neared the shore the tide-watchers were seen standing up to their necks in the sea off the blazing coastline. There was no place on the island where they could have remained, and here they were braving the sharks and the venomous sting rays.

Their paraffin cooking stove had exploded and this had ignited the tent, and the dry scrub soon followed. It was a fortunate thing that the ship had not been further away when the fire started, for with the radio and all their food supplies gone the two campers would have been in a desperate position.

The islands in the Great North-East Channel are small and featureless apart from the usual clumps of coconut palms, which so obscured the view that in many cases it became necessary to build survey marks over 60 feet in height. The Admiralty *Manual of Hydrographic Surveying* includes a set of instructions for erecting such marks, and as Thomson had not built one of these before, he took this book with him when he landed. 'With resources normally available', reads the manual, 'pole marks up to a maximum of seventy or eighty feet in height may be erected without difficulty.' Thomson followed the directions as they went on to describe the procedure, using such resources as barlings, bamboos, tail-blocks, mast-ropes, heel-ropes, smiting lines and five iron stakes—'nine if the ground is soft,' said the manual. However, he felt that the phrase 'without much difficulty' was perhaps an understatement. By late afternoon the mark was up, towering proudly above the palms, but unfortunately so was the gantline and a boatswain's chair with a sailor in it all lashed to the top of the mark.

After a further hour or so this sailor had been rescued from his pole-squatting position and the party were ready to return to the ship. On the beach they found the coxswain of the motor skiff, which they had left anchored offshore, shivering with fright. He had got bored in the boat as she lay tossing gently beyond the reef and had swum to the shore. The man swore that he had been chased by a shark, and sure enough there was the beast in the shallows waiting for his supper. With much splashing the shark was frightened away into deeper water, and then of course someone had to go and get the boat. The men's eyes turned meaningly upon their leader; there was no option, and young Thomson struck out for the skiff. Never had a 200-yard swim seemed to him so long, and never had the difficulties of climbing into a boat from the water seemed to him to be so insuperable. But when he reached the boat he found that he was into it in a flash.

There was little social activity apart from the visits to Thursday Island, where there was an open-air cinema. Here also was the Pilot House, the headquarters of the pilotage service. Sunday morning here was washing day and one or two Torres Straits pilots and a few naval officers from the sweeping trawlers could be seen on such occasions, clad in shorts, bending over enormous bubbling cauldrons full of khaki 'dhoby'. The heat and the sweat of this work brought on a fine thirst for the Sunday forenoon gin, for there were enough supplies to permit this weekly relaxation.

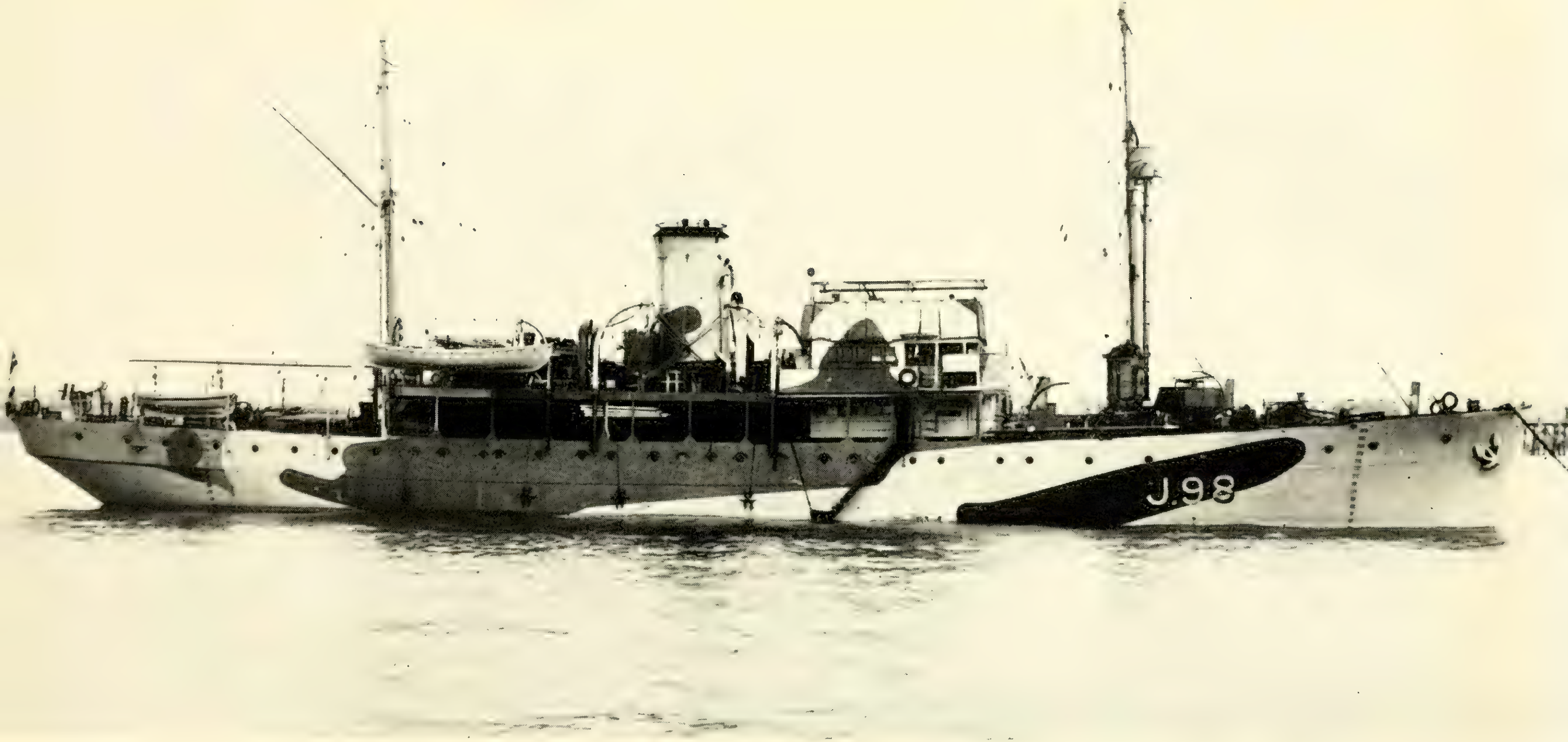
At this time there were no women on Thursday Island, except for one Army nurse, so that it had become habitual for the men from the trawlers and those stationed on the island to bathe in the nude. Sometimes it would be rumoured that the nurse was walking in the direction of the bathing beach, and this news would send a hundred naked men running up the sands to reach their shorts.

Friday Island, nearby, was swarming with deer. In normal times these were protected, but there was usually a meat shortage in the sweeping trawlers and it was extraordinary how often the surveying mark on the summit of Friday Island fell down and had to be re-erected by a party from these ships.

The ship anchored for a few days off Coconut Island in the North-East Channel and the King came onboard. 'King of Coconut Island'—what a remote and romantic figure this title conjured up! But when he came onboard he proved himself a man of the world. When asked if he would take refreshment, he answered without hesitation that he would have a gin and orange. The party who landed from the ship at his invitation to take part in a feast found that they were expected to go to church first.

The operation of sweeping the channel had begun in October 1944 and was completed at the end of April 1945, when the Task Unit was disbanded—a good job done despite the fantastic tidal streams and the very boisterous weather that had endured during

MAKING SAIL



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CAMOUFLAGED—SHEERNESS, MAY 1942. BEFORE SAILING TO JOIN THE EASTERN FLEET

March, when for days at a time the smaller vessels of the team were forced to remain at anchor in the channels waiting for the winds to moderate. U.S.S. *Mesquite* arrived in March and, as a result of the survey, laid buoys and erected navigational beacons along the selected route.

Challenger returned now to Trincomalee in Ceylon and it proved to be a nightmare passage across the Indian Ocean. The main boiler room fan broke down, and the auxiliary fan was not found to be up to the work. The temperature in the boiler-room rose to 160 degrees and the stokers working there were able to do tricks below of only about half an hour's duration before they had to be brought on deck to cool off. The ship's speed was down to about 3½ knots and it often seemed to those onboard that they would never cross that stifling ocean. However, at Colombo, which was at long last reached, these defects were made good and the ship once again returned to survey off Trincomalee.

V.J. Day found the ship in Singapore, bringing the charts up to date by fixing the numerous wrecks and obstructions that had accumulated during the time of the Japanese occupation and by re-surveying those parts of Keppel Harbour and the approaches to the Naval Base that were likely to have altered during the war. Relieved at Singapore by H.M.S. *White Bear*, which had been serving with the Eastern Fleet during the recent Burma and Malayan landings, *Challenger* sailed with the minesweepers to carry out what was termed a 'rehabilitation' survey of the river bar and approaches to the port of Saigon. From there she went on to Hong-Kong for similar work, and a complete new survey of the whole of that port was made. In January, 1946, she was re-surveying the approaches to the North Borneo and Sarawak ports of Jesselton, Brunei Bay, Labuan, Muara and Kuching. Many of these places had been the recent scenes of fierce fighting and were cluttered with wrecks, while the river approaches to others had changed during the war years. Such surveys facilitated the import of food and clothing, which at this time was a vital necessity in this part of the world where the local populations had suffered so badly and for so long at the hands of the enemy.

These were the last surveys of the commission, and in March, 1946, the ship once again reached Portsmouth with her paying-off pendant flying.

XIII

The Persian Gulf

A CENTURY ago Great Britain signed truces with a number of Sheikhs who ruled territory stretching from Muscat at the entrance to the Persian Gulf westward along the southern shores of the Gulf as far as and including the Sheikhdom of Qatar, which covers an extensive peninsula running northwards from the Arabian shore. To the west of the northern tip of Qatar lies the island Sheikhdom of Bahrein, and it is on this island that Great Britain, by arrangement with the Sheikh of Bahrein, maintains a small naval establishment housing the shore headquarters of the Senior Naval Officer in the Persian Gulf. The British Political Resident for the Gulf area has his residency within the naval base.

Our agreement with the so-called Trucial Coast Sheikhdoms bind us to protect them from outside interference, and a small naval force is stationed in the Gulf for this purpose. Under the Political Resident there are a number of Political Agents who are stationed in the various Sheikhdoms and who keep in touch with political matters in those states. The Royal Navy and the Political Resident thus find themselves working very closely together in this interesting area.

The great bay which lies between the Qatar peninsula and the entrance to the Persian Gulf, and which is bounded on its southern side by the Trucial Coast, was, in 1946, little surveyed. It is studded with a mass of shoals and coral reefs interspersed with a labyrinth of deep navigable channels. Sand suspended in the water after the storms which are frequent in the winter months gives the appearance, when the sun is shining, of shoal water, which adds to the general difficulties of navigation in this area, where it is desirable that our naval ships should be able to move swiftly and safely when the occasion arises.

The area was already on the post-war survey programme when urgency was further added to the task by the decision of the

Petroleum Development Qatar Ltd., an associate of the Iraq Petroleum Company, to develop the oil field which their prospectors had proved in the Qatar peninsula in 1940, but which had remained unexploited throughout the war. Now, with the approval of the Ministry of Fuel and Power, it was hoped to export crude oil at an initial rate of 1,000,000 tons a year at the earliest opportunity.

The oil field had been discovered in the south-west of the peninsula and the company had carried out a preliminary survey at the time to find out how best the oil might be shipped from this difficult area. The Dohat as Salwa, the bay which lies between Qatar and the Saudi-Arabian coast running northwards towards Ras at Tannura, was far too shallow and reef-encumbered to permit the approach of tankers, although barge routes were found later in this area through which the equipment for sinking the wells was shipped from Bahrein. So the company surveyors looked to the eastern shores of Qatar and found two or three places where deep water came fairly close to the shore, and where there seemed to be some hope of the deep draught tankers approaching the coast sufficiently close to permit them to embark oil through pipelines led out to the buoys at which the vessels might lie secured.

The north-west winds, which blow frequently in the winter months and are known as 'shamals', have already been described, and it is these winds, often prevailing for days at a time, which raise short, choppy seas that would seriously interfere with the embarkation of oil through these loading lines.

Of the various east-coast sites investigated by the oil company surveyors, the place where the deep water came nearest to the shore was about 15 miles south of the town of Doha, the seat of the Sheikh of Qatar. Here deep water had been found within 200 to 300 feet of the shore, with a long reef known as Fasht al Arrif running to seaward close north of the position which gave that vital protection from the north-westerly shamals. If only this anchorage had suitable access for ships through the maze of reefs which could be seen offshore, then it might prove the ideal position, to which the oil could be piped overland from the west-coast wells, a matter of 50 miles distant.

But this offshore surveying was beyond the capabilities of any but a large sea-going hydrographic unit, and the Iraq Petroleum Company applied to the Admiralty for assistance in this matter at just about the time that the Hydrographer, now Admiral Wyatt, was completing his post-war survey plans for this area. *Challenger* was in fact on her way to the Gulf and was at this time carrying out a survey of the Daimmiyat Islands before proceeding to carry out surveys off the Trucial Coast; so that it only needed a directive to her to give priority to that part of the coast directly south of Doha where it was hoped to find a channel leading into the sheltered deep water south of Fasht al Arrif reef.

Captain Sam Southern was now in command of the ship and he had with him several old *Challenger* officers. The First Lieutenant, who had been in charge of the ship during her recent refit, was responsible for the great amount of useful additional gear the ship now carried, for he had found a simple way of obtaining such things in the dockyard at Chatham. He had carried a piece of chalk with him and had put the ship's name on anything useful he saw lying in the yard, and sooner or later this resulted in its being delivered onboard by the authorities. Charles Grattan was the Navigator and he was proud of the fact that he had been in the Gulf in *Challenger* before the War; this led him to remark to a junior officer on the bridge, as they approached Bahrein and saw the oil flare at the refinery at Sitrah, that he had sighted this on occasions at a distance of 100 miles. The Captain, who always enjoyed a leg-pull, at once said, without a smile on his face, that he had seen it 101 miles distant, and turning on his heel left the bridge and Grattan in a fury.

A visit was first paid to Bahrein, where the Captain obtained a letter for the Sheikh of Qatar from Sir Rupert Hay, the Political Resident, so that the Sheikh should know what this strange white ship was doing, and that her men who would come ashore in the wastes of Qatar were not evilly disposed but would be hastening the day when the first barrel of oil would be exported and the first royalties become available to the Sheikh, who had ruled his barren lands for so long and was about to see his desert flower indeed.

The ship came to anchor off the crumbling stone township of Doha, which is scattered along the shores of a lagoon protected by off-lying coral reefs. A shallow channel through these reefs, marked by a stone beacon long since fallen into decay, and used for centuries past by the trading dhows and vessels sailing to the pearling banks, permitted the entry of the ship with only a foot or so of water below her keel. The letter was carried to the Sheikh in his cool dark quarters in the town and to it he gave a verbal and unenthusiastic acknowledgment.

Next day the ship sailed southward and anchored off the Fasht al Arrif reef to appraise the situation and commence the work which would prove whether or not there was access for shipping to this place, otherwise so well suited to become the oilport of Qatar.

The unsurveyed sand dunes of this desolate place stretched away to the westward like waves of the sea; to seaward patches of blue and light green water showed the complexity of the work in hand. The low, bare island of Al Bushirya was to be the site of the base and the starting point for a triangulation which was, during the next five years, to be carried right up the east coast of Qatar, around the end of the peninsula to Fort Zubara, and thence across the shallow reefs to the Island of Bahrein, where it would close on a position, long since fixed by an earlier surveying vessel, in the garden of the Political Agent in the town of Manama. However, in December, 1946, that day of closure was very far distant, and by the time this was achieved other more modern vessels would have taken over the task from *Challenger*. But thoughts onboard were on the job in hand and the little recreation that was available to officers and men.

Sam Southern was an enthusiastic fisherman and at the week-ends he usually went off on an expedition with a small party of officers to the Hat Islands, which lay to the southward, girdled by steep-sided coral reefs, along the edge of which the motor skiff slowly made her way as the fishermen trolled over her stern with home-made lures. The Engineer Officer was always encouraged to come upon these trips, for motor skiffs are temperamental things and a fishing party lost much of its pleasure if the fishermen spent the heat of the day churning the starting handle instead of watching their lines trailing into the green waters astern. Often the catches were good but sometimes the biggest fish were attacked even while they were being played on the line and a huge head was all that was taken aboard. It was even more difficult to persuade the Engineer Officer to come on these trips after an unfortunate incident which occurred when the skiff had returned one night. He was standing on the gunwhale of the boat and holding onto the ship's side; slowly the boat began to leave the ship and slowly the figure of the Engineer became more horizontal and less vertical until the big splash came. All the onlookers were highly amused and Sam Southern's well-known smile spread across his face until it was realised that his cherished fishing rod had been in the Engineer's grasp and it had sunk beyond recovery.

The ship's Medical Officer, Surgeon-Lieutenant P. T. Rutherford, R.N.V.R., tall, athletic and red haired, was also a great sportsman and was in on all the fishing trips to the Hat Islands. He specialised in making his own lures, which lay about his cabin in differing states of completion together with his home-made tools for their construction; here and there hung a bird's wing which had been collected for making lures but now lay rotting and forgotten. His desk, which was stained from much use and spillage of photographic materials, was piled with the wardroom wine accounts, of which he was the custodian. Fishing rods and gun tackle were slung up here and there and stowed in the corners of the cabin. In his washbasin lived two small turtles.

One day when the Medical Officer was sitting in this crowded compartment busy at his lures the Petty Officer Steward brought onboard some peculiar looking domestic ducks which he had bought in the souk (market) at Doha and he was busy despatching them on the forecastle. One of these was taken down to the doctor freshly killed and he was told that there were hundreds of such birds passing over the ship. He seized his shotgun and forcing two cartridges into the barrels as he ran up the ladder, he raced here and there about the decks searching the skies in vain for a 'right and left'.

Ship's sports were organized to take place one week-end on a sandy expanse ashore and Rutherford won each event steadily until he decided to cancel his entry for the later events so that some of the others should have a chance. Tug-of-war, that most barbarous of all sports, was on the programme and the Wardroom team struggled and heaved their way into the final against the stokers. They might even have won this, but whenever they looked like winning the supporters of the stokers' team got carried away and clapped onto the rope to save the situation. Finally this idea caught hold, and despite the protestations of the referee, the whole Ship's Company were soon on the rope pulling the Wardroom away across the sands.

This was an uninhabited part of Qatar; not even the ruins of a village were to be seen, but upon the reefs were built long low stone walls which formed a crude type of trap to catch the fish on a falling tide, and to these would come the solitary fishermen. They wore a loincloth pulled up between their legs and a cloth so casually wound about their heads that it was difficult to understand how it remained in place as they waded about the reefs inspecting their traps and occasionally bending down to effect repairs to the walls. They paid little or no attention to the surveyors nor did they interfere with the tempting marks which the surveyors were now erecting upon the shallows.

At first it was very difficult to use the ship for sounding at all, for there were indications of shoals on every hand. On more than one occasion the ship was pulled up or turned within feet of a coral outcrop, and once the log, which protrudes below the hull, was bent as the ship grazed over a shallow area. Charles Grattan, the Navigating Officer, considered this technically a case of grounding and ostentatiously filled in the necessary official report forms which he submitted to Sam who cast them into the waste-paper basket as often as they were handed to him. On the field boards the boats were slowly drawing the complex picture of the reefs with the deep channels between them and indicating areas where the ship could safely work. Most interesting of all, a deep channel was found running northwards between Fasht al Arrif reef and Fasht al Odaid through which it would be possible for tankers to pass when its narrow limits had been marked with buoys.

The oil company had a survey launch of their own to which Lieutenant Trapper Croome was now sent to assist with the positioning of the buoys along this channel. On the first morning of his stay onboard the launch he was surprised to be offered brandy for breakfast, and on his protesting that the sun was not yet over the yardarm the Captain of the launch went on deck and lowered the offending obstruction to the sun's steady progress.

And so the winter months of 1946–47 passed in the Persian Gulf with occasional visits to Bahrein, where the officers found a welcome at the charming home of Sir Rupert and Lady Hay. Here they met many interesting personalities, for the Hays kept open house every evening between 6 and 8 p.m., and here came all men of interest who were travelling through Bahrein, oil prospectors, oil company executives, sheikhs' advisers, and Arabian travellers. Sharp at 8 o'clock one took one's leave, for the evening meal was served at exactly quarter past and on this Sir Rupert was very firm. He was a man of majestic stature and healthy appetite. He had served many years in India and on one occasion had attempted to bring hostilities between two warring tribes to a halt. It was said that he first visited the chiefs of one tribe, with whom he took a meal of considerable proportions. He then crossed the valley to the camp of the opposing side, and again had to take hospitality in a similar form. Two hours later he reached his home and was at once anxious to know if luncheon was ready.

Sir Rupert himself was in touch with every aspect of the complicated political life of both shores of the Persian Gulf; a visit to the Residency was refreshing indeed and sent one away with a new interest in the ramifications of life on the coasts of Arabia.

Occasionally a visit was paid to Basra to fuel. This meant entering the Shatt el Arab through the dredged Rookah Channel, for although Basra once lay on the shores of the Persian Gulf it is now situated 70 miles upstream. The silt-laden waters of the Shatt are still thrusting a sandy shelf out into the gulf and the adjacent coastline creeps steadily out to sea, while at the entrance Man toils unceasingly with dredges to keep open this vital river serving the three oil ports of Basra, Abadan and Fao.

The river flows between banks which are clothed with forests of date palms which support a great industry in Basra, and for many hours the ship steered her twisting course among this unfamiliar green. Berthed at Basra, the men were able to enjoy the amenities of the small R.A.F. Station and the doubtful pleasures of the tawdry cabarets which serve the vilest of 'Scotch' accompanied by the most dismal of floor shows. The artistes who have travelled eastwards across the Mediterranean have reached their nadir and final resting place, for there is nothing for them any further to the east.

The officers spent their time at Basra in an orgy of buying Persian rugs. This is a pleasing pastime, if somewhat expensive. They sat for two or three hours in the cool high room of the carpet shop, sipping the hot black coffee which burned the tip of the tongue as the merchant and his assistants pulled down from their shelves carpet after carpet which they unfolded upon the ever-increasing pile. A small boy was constantly on the run to the nearby coffee shop, hurrying with the small hot cups and the glasses of iced water to go with them.

Then there were the never to be forgotten duck shooting expeditions in the boundless marshes around Hammer Lakes, conducted by Mr. Angoorli, the King of Iraq's game warden, who is well known to every naval officer addicted to this sport who has served in the Persian Gulf.

By May the weather had become too hot for surveying and the ship moved to Cyprus. Then, after a refit at Gibraltar, she returned in December, 1947, to continue the survey of the Gulf.

There had been a number of changes among the ship's company at Gibraltar, for by now many of the men who had been called up for the war were being demobilised, with the result that the disturbed post-war conditions were rendered even more unsettled by constant changes throughout the Service; General Gordon was once again in the ship, having relieved Trapper Croome, and Charles Grattan had been invalided home. His relief was Lieutenant-Commander Bill Ashton, joining the ship for the first time—bluff and jolly, this most likeable of fellows brought life and good humour with him to the ship.

The voyage was delayed at Aden, where the ship arrived on 4th December, 1947, to find serious disturbances had broken out ashore between the Arabs and the Jews following the partition of Palestine. There were many Jewish merchants and shop-keepers in Aden and their shops had been broken into and set on fire. About 100 people altogether had been killed in the subsequent rioting.

H.M. destroyers *Contest* and *Cockade* had arrived the previous day and had already landed armed patrols to which *Challenger*'s modest party was now added.

Captain Southern, as the senior naval officer present, conducted the naval side of the operations ashore, where the Navy were assisted by the Royal Air Force and the Aden Protectorate Levies.

Gradually the situation began to come under control and it was not long before the sailors on the barricades in the Crater area were receiving coffee and tea from both Arab and Jew, the very people upon whom they had been firing, without, it must be said, much lethal effect, only 24 hours before.

One night, however, one of the naval sentries saw a figure moving stealthily towards him through the darkness. He called to the figure to halt, but this order went unheeded. A shot rang out in the night and the figure stumbled and fell. The officer in charge of this section of the town hurried to the spot and, with the sentry, went forward to see whether Jew or Arab had fallen. The figure which had ignored the order to halt, and had moved unconcernedly during the hours of curfew, proved to be a goat.

The survey off the coast of Qatar was being continued north-eastwards in order that a route might be located from the centre of the Gulf into the port of Umm Said, which was already under construction in the lee of the Fasht al Arrif reef.

A new ship's Medical Officer was on his way as relief for Rutherford, who was to return to England. This was Surgeon-Lieutenant F. S. Preston, R.N.V.R., who was travelling in H.M.S. *Wren*—one of the frigates forming the Persian Gulf squadron—and *Challenger* made a suitable rendezvous with *Wren* so that Preston might be transferred. As none of the officers was known to Preston, it was decided that they should exchange uniforms before he came onboard. The Paymaster became Doc. Rutherford, awaiting relief, while the others exchanged uniforms as they could; General Gordon was too small and the Boatswain too large to wear anyone else's clothes. Bill Ashton was in civilian clothes and represented an American oil man who was taking passage to Doha in the ship.

Preston came onboard before lunch and at once felt that he was amongst a jolly but somewhat peculiar crowd of officers. Doubtless they were suffering from too long a period stationed in the Gulf and there would be good material for psycho-analysis later when he settled down. It was not long before the Sick Berth Petty Officer, who was also in the game, reported to Mike Harvey, the Paymaster, dressed as the Medical Officer, that a stoker had broken his arm. Harvey rounded on the petty officer and gave him a thunderous blast for disturbing him: 'You know my hours. Tell him to report at 9 o'clock in the morning,' he concluded. The new surgeon's eyes goggled and he made mental resolutions to change this amazing procedure as soon as he took over.

Meanwhile the Sub-Lieutenant, who was dressed in the Paymaster's uniform, was twiddling with the safe combination in the Paymaster's cabin and to his surprise and delight it came open. Taking a wad of notes from the safe, he walked into the wardroom brandishing the money and asked who required a 'casual' payment. The real Paymaster was horrified at this and shot out to change the combination under the guise of drawing his casual.

Ashton was all the while telling tales—in the broadest American accent—of life in the oil fields of Texas, and Preston wondered how far it was to Doha and how long it would be until this insufferable bore was landed.

When the officers put on their own uniforms for dinner, Preston was even more baffled.*

Doha would grow in importance as the oil fields in Qatar developed, and so Bill Ashton was landed with a camp party on Jazirat Safliya, an island on the north side of Doha harbour, to make a chart of this area. As well as the usual stores of food, survey marks and tents, water was a serious problem when planning any camp in the Gulf, and many drums of water had to be landed with the party. Everything went well, the stores were landed and stowed, the moorings for the sounding boat were laid and the tents were rigged. All was hustle and bustle; in fact, in Bill Ashton's phrase, 'everyone was as busy as bird dogs'. By nightfall the camp was a blaze of light powered by the portable generator, but this was short lived, for in expectation of heavy dews a canvas sheet was laid over the generator for its protection which succeeded in cutting off completely its air supply and it burnt out and the lights faded. If there were heavy dews there must also have been heavy evaporation, for the following evening the water in the drums had shrunk alarmingly and discontinuance of shaving by all hands was ordered. The campers at once began to assume that scruffy appearance which comes to all beard growers in the early stages.

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* The removal of coloured distinction cloth from officers' uniforms by order of Their Lordships on 1st January, 1957, has robbed high-spirited officers of the joy of inflicting this hoax on newcomers.

Bill Ashton was soon friendly with the few dhow crews that passed that way, and as he wished to have everything possible laid on, he returned late from surveying one evening to say that he had been arranging the camp fish supplies. At about 2 a.m. Ashton's assistant heard a gentle scraping on the canvas of the tent, and lifting the flap saw in the light of his torch an Arab of uncommonly evil appearance. He had but one eye and a few straggling hairs for a beard and in his scrofulous hand he held a coarse, grey sting ray. Its skin was dry and cracked, and here and there it was coated with sand, which had adhered to it when it had been set down upon the ground. 'Fish, Sahib, Fish,' said the fisherman, holding up the ray into the full light of the torch. Ashton was informed that the fishmonger had arrived and a long conversation then took place outside the tent between Ashton and the seller of fish. 'Fish, Sahib, Fish'—again and again came the dismal chant to which Ashton parried, 'Yes, my dear fellow, but I didn't say at 2 o'clock in the morning.' The fishmonger only left the camp in peace for the night when he had been given some tinned rations in return for the inedible fish which he left behind upon the sand.

If water had been scarce in the early days of this camp it came in abundance one night when a shamal of unprecedented ferocity began to blow. At first the campers ignored the wind until the tents began to flap and pull at their pegs, uprooting them from the loose sand. The men then had to gather large stones to keep down the edges of the canvas, and as soon as they retired again into their camp beds the rain began to pour down in a way they had not believed possible in the desert. It flooded every tent, carrying sand with it into the bread supplies, the cooking utensils and the bedding. And still the wind blew harder, till it became a full-time job for every man to keep his tent from blowing into the sea. It was a long night, and the campers were not the only sufferers, for at daybreak they saw dhows and other smaller craft, which had lain at anchor in Doha, scattered hither and thither along the reefs, their crews struggling in the shallows around them in their efforts to lay anchors and prevent their craft being forced even further onto the reefs by the gusting north-west shamal.

Far out off the Qatar coast lies the small island of Jezirat Halul, named after the she camel, perhaps on account of its high, humpy aspect. It is utterly bare and the party who were established in camp here to take astrolabe sights and watch tides found it strange that the tents were soon overrun with rats which scuttled across the sleepers in the night and nibbled at the hard flesh on the soles of the men's feet if these happened to be exposed. But they were soon to know how these rats lived where not even a blade of grass grew. A dhow drew near the island one day and white-clad Arab sailors landed from it in a small canoe they had towed astern. They brought with them the body of a dead crew-mate to bury upon the island, for this was the graveyard of the dhow sailors of the Gulf.

In April the ship once more sailed thankfully for Cyprus, and in July was refitted at Gibraltar, where fair charts of both Qatar and Cyprus were drawn by the surveyors.

Sam Southern had been appointed to England as Assistant Hydrographer and thus the time had come for him to leave his last sea-going command. This was a sad day, for all liked Sam; he loved a good leg-haul and he loved a good 'run ashore', as the sailor says. On his last night a party of officers from the ship took him over the border to La Linea, the little Spanish town where many a good night had been spent during the ship's visits to Gibraltar. There was a fiesta on in the town on this occasion, and after taking sherry in the different bodegas the party visited the fairground. Bill Ashton, always in great form on these occasions, was here there and everywhere, now borrowing the microphone from a seller of raffle tickets and whipping up more custom by touting for him in English, now taking over a barrel organ from its operator, and all the while shaking hands with everyone and welcoming them to the fair. For Bill was well known over the border and a great follower of the bullring. At 2.30 in the morning the party had bacon and eggs at the Rock Hotel while Sam declaimed the 'Hunting of the Snark'.

Commander J. M. Sharpey-Schafer was the new Captain; this was to be his third and last commission in the old ship.

The United States Hydrographic Office were now to take a hand with the surveys in the Gulf for they were interested in the coast of Saudi Arabia lying to the west of Bahrein, where American oil companies had been operating for a number of years. So it was that the U.S. Survey ship *Maury* arrived in Gibraltar with her three tenders on her way eastwards. Calls were, of course, exchanged between the Commanding Officers of the two survey vessels. It was *Maury*'s captain's first visit to the Gulf, and when he visited Sharpey-Schafer he was anxious to hear as much as possible about conditions there. Talk turned to tides in the Gulf and Sharpey-Schafer, in his serious way, began to describe the tidal complications of the area in considerable detail. He paused from time to time to enquire if *Maury* was still following the gist of this complicated discourse, to which he was able to say 'Yes, Captain', until at length, when the complexities of ebb and flow, spring and neap and range and mean tidal level had become really abstruse, he changed his stock reply. 'Well, Captain, I guess I've just about lost you now.' Meanwhile, as it was early in the day, tea had been made by the Captain's steward and had been set in its pot upon a tray in the cabin, becoming steadily stronger during the course of this lengthy discussion. As *Maury*'s Captain sipped the dark brown brew he remarked, 'Well, Captain, I've seldom drunk tea before. When I came through New York I bought some as I knew I had to entertain the British. I guess that it should be made much stronger than I was told.'

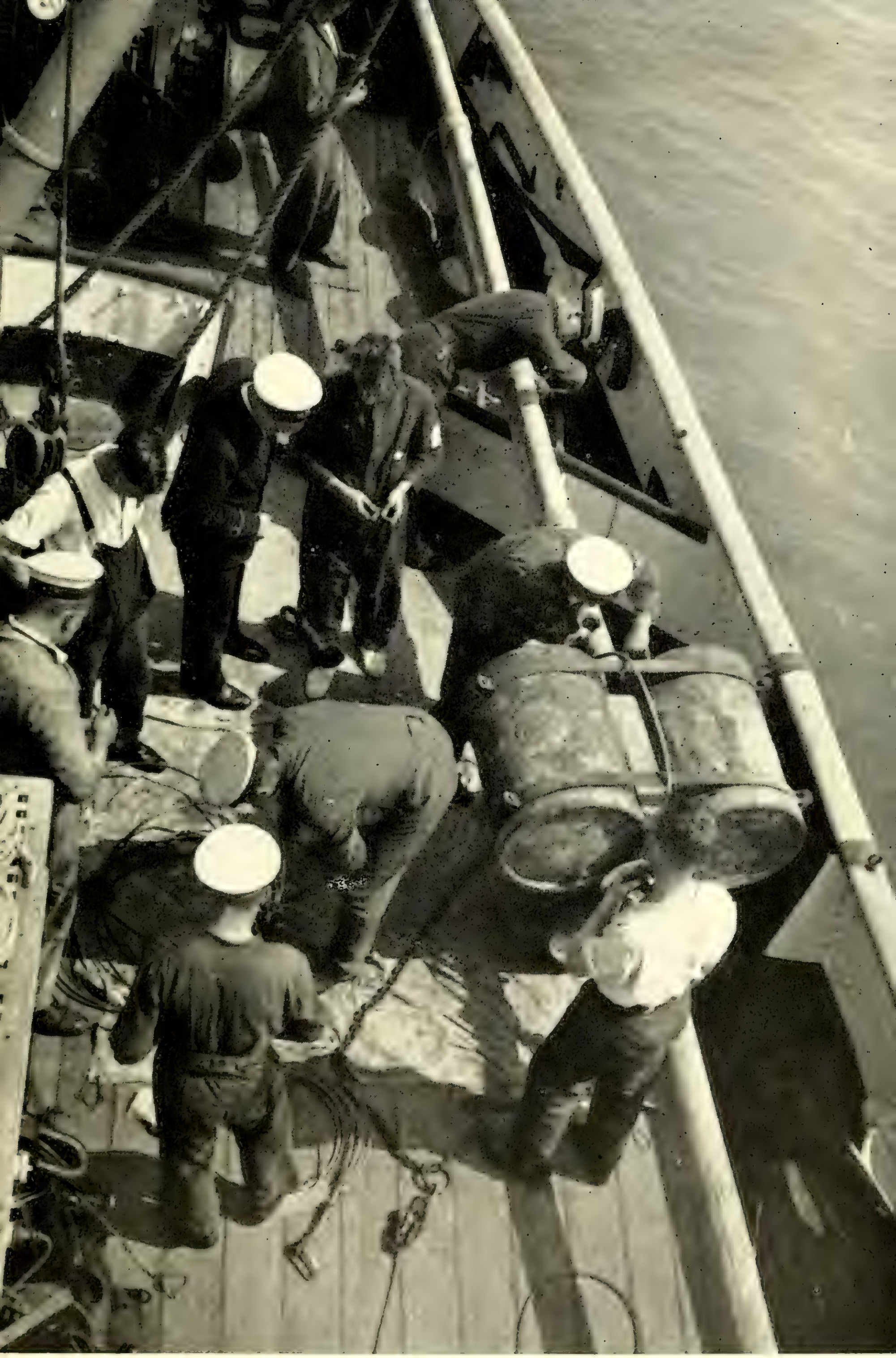
On completion of the refit the ship went to sea for full power trials, these being so arranged that the ship visited Tangier for a few hours, and a number of Dockyard officials were taken on this day's jaunt. When the ship came to leave Tangier in the afternoon, a different pilot from the one who had boarded the ship in the morning offered his services. He was a strange-looking little man in a well worn Palm Beach suit and battered brown topee. He did not inspire confidence, but as pilotage was only a formality here he was accepted. By the time the ship passed through the entrance the pilot boat which was following had broken down and was far astern. As the ship lay-to and waited for the boat to come out, one of the officers said to the pilot in a joking manner, 'Why don't you swim for it, Pilot?' Without further word the little man jumped overboard fully clothed and, swimming shorewards on his back, waved good-bye to the ship.

In the Red Sea—at Tor in the Sinai Peninsula, at Suakim in the Sudan and at Kamaran, a group of islands off the coast of the Yemen—there are quarantine stations at which pilgrims journeying to Mecca in the season are housed long enough to isolate those with infectious diseases before they travel on by ship to Jeddah. On her way south *Challenger* visited Kamaran, which is under British control, so that the beacons and buoyage provided for the navigation of the pilgrim ships might be improved. Here was Colonel Thompson, who had been the Administrator for 18 years, with a staff of Indian doctors and a company of Somali soldiers. The whole station was run on the smartest military lines and was frequently visited by persons of importance, for it was also the calling stage for the Aden and East African air routes. At this time the only such person present was a relation of the King of the Yemen, who, fearing assassination for some reason, had fled to Kamaran for a while, and was enjoying his stay, for he kept demanding the best brandy—only that which came out of the 'three star bottle', said he.

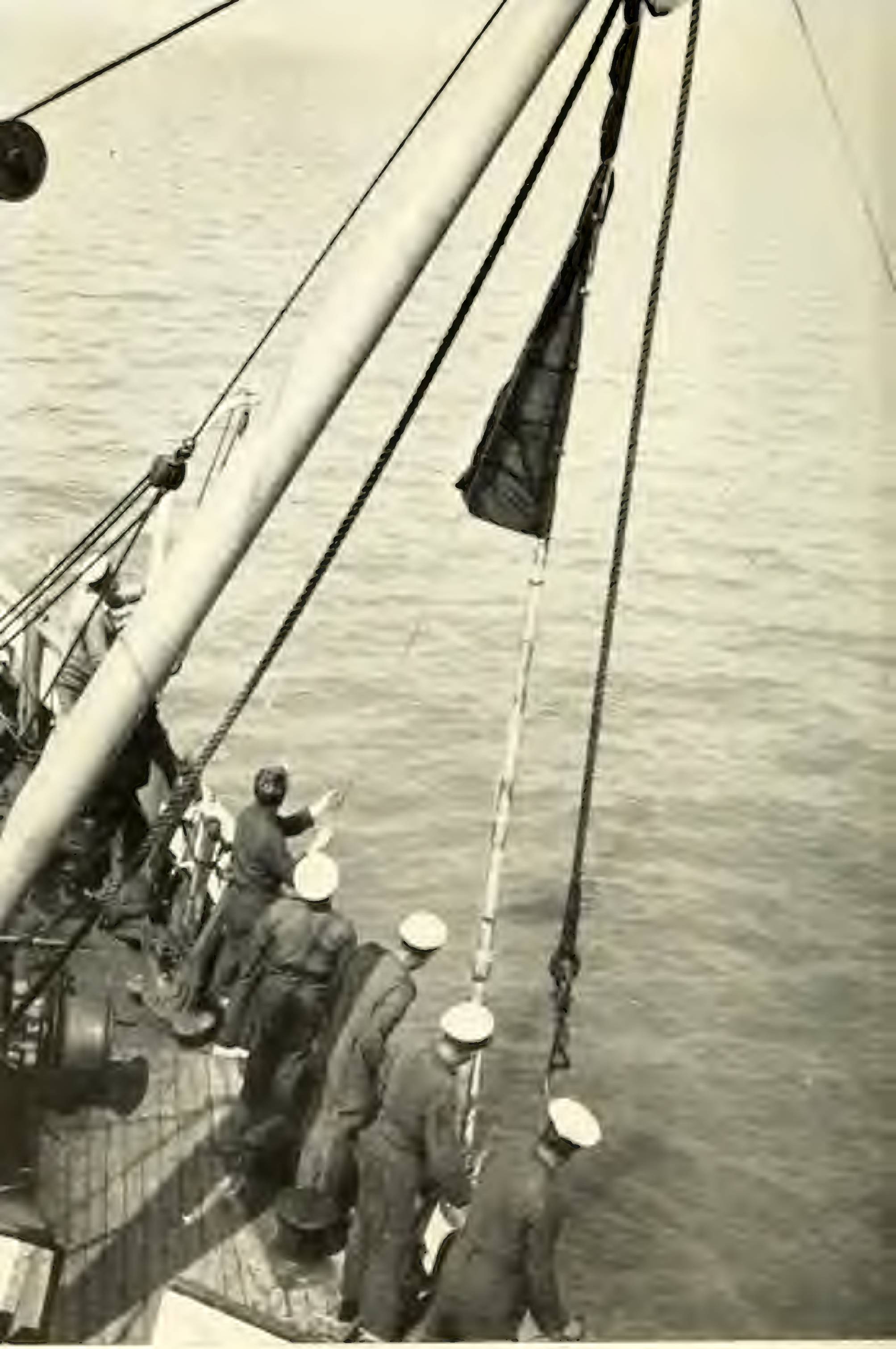
In the Gulf the survey was taken up where it had been discontinued earlier in the year. The first job was to carry the triangulation northwards along the desert coast from the vicinity of Doha. The ship carried two jeeps for such work. The country north of Doha is more populated than elsewhere, a road of a kind running from here to the northern tip of the peninsula, and for about the first twenty miles or so this road passes through substantial villages built of stone and sunbaked bricks clustered around the residence of a minor sheikh. Twenty-five miles north of Doha, Khor is reached, a township formerly of some importance in the pearling trade, for it is situated at the head of the landlocked harbour of Khor Shaqqiq. But of recent years this inlet has become extremely shallow and the perimeter of the town has tumbled into decay, its few inhabitants using the stones from these ruins to bolster up the few habitable houses at its centre. To travel the road to Khor is a slow business, for at each village the sheikh or headman welcomes the traveller; his coffee maker is awakened and is soon hustling round with his battered coffee pot and a handful of cups no bigger than egg-cups. Into these he pours the dark brown liquid, which is strained as it leaves the spout by some fine vegetable fibre lodged there for the purpose. The coffee is strongly flavoured with cloves and bears little resemblance to coffee as the westerner knows it. But it is refreshing, and one is apt to forget that it is customary to refuse a third cup.

Air photographs of the Qatar peninsula indicated the high knolls and ridges that were the only features in the desert upon which triangulation stations could be raised. The triangulation in the form of quadrilaterals lay between the road and the sea, and to reach these stations it was necessary to leave the road and strike out across the stony desert; sometimes the going was crisp and fast, sometimes boulders the size of a football littered the sand as far as the eye could carry and it was only possible to cross this type of country in a jeep by going dead slow or at full speed. Full speed too was needed to cross the areas of soft sand into which the vehicle would sink axle-deep if speed was reduced.

The inshore sounding and triangulation camp was set up this year on the shores of Khor Shaqqiq, and so it was that two motor-boats from the ship were feeling their way into the Khor one sunlit day in January, 1949. The channel was narrow and tortuous, with only about four feet of water. On either side coral heads and amber-coloured coral flats lay shivering beneath the shallow water in the light northerly breeze, which was blowing sufficiently only to form the smallest waves upon the surface of the sea. Low cliffs about five feet in height bordered the dun-coloured headlands, which lay about half a mile to north and south of the channel. Two porpoises moved with the boats, rising time and time again just ahead and disappearing with short snorts like a man gasping for breath; a solitary tern wheeled above them uttering its wild shrieking cry. There was no other sign of life ashore or afloat. Soon the channel bore round to starboard and led, between the mainland and a somewhat higher island, into a landlocked harbour. The boats began to work along the south side of this bay searching for a landing, but so shallow was it that they kept having



RIGGING A SURVEY BEACON ON DECK



LAYING A MOORED SURVEY BEACON

to go astern to avoid hitting coral heads just below the surface of the water. At last the shore was reached and the unloading of the equipment began. A mile to the westward lay the township, barely distinguishable at this range from the brown desert itself. As the party worked at erecting the tents a group of boys were seen coming along the shore; arrived at the centre of the camp they sat upon their haunches, where they appeared to remain for the following six weeks.

Bill Ashton was again in charge of the camp, which this year was of a greater size. Four officers and 25 men were housed in three double-canvas marquees and five ridge tents. Two motor-boats lay at moorings off the site, and both jeeps had arrived from the south bringing with them a water distilling plant borrowed from the oil company. Fuel to operate these craft and vehicles had been landed in large quantities in chartered dhows.

North of Khor the road becomes less used and is harder to follow; no more villages are encountered. The area is populated thinly by beduins who move with their flocks and live in tents. They are not always on the move, however, and they spend much of the year camped in the vicinity of their wells, which are few but good, and by employing donkeys for about six hours in every day to haul up the water in goatskins from the bottom of the wells, these small communities, under the guidance of their head-men, are able to cultivate a small garden where green vegetables and a few dates can be grown and sometimes even a small grove of trees to give shelter. The water, once hauled from the well, is precious and is guided by small runnels to every corner of the garden as each plant requires.

The first day's work in this area entailed the erection of a large number of flags upon hop poles which were guyed in position. These were placed on the knolls which had been chosen as triangulation stations, each about three miles distant from the next. At the end of the day the party were pleased with their progress for they were ready to start observing the main angles the next day at sunrise so that the main part of the work would be completed before the daytime shimmer of the desert made observing impossible.

As the teams motored across the sands in the cold morning air they were surprised to find no trace of the marks which they had laboriously set up the day before. So Ashton, with some members of the camp, went that evening to see the Sheikh at Khor. The township seemed deserted, but as the little party walked through the ruins towards the centre of the town they caught an occasional glimpse of the black-clothed figure of a veiled woman scuttling for shelter like a nocturnal animal surprised away from its lair before sunset. However, a small boy was headed off as he ran for cover, and he was persuaded to lead the party to a wooden door in the high, brown stone wall surrounding the Sheikh's residence. The party were admitted by a man of negroid appearance and conducted to a cool, high room with whitewashed walls. The slave at once began to pull down bundled rugs and laid them one upon another on the floor, and then the Sheikh shuffled in. He may only have been a headman but he was always referred to by the camp party as the Sheikh of Khor, and it seemed a flattering title. With sign language, a dictionary and the little Arabic he knew, Ashton told his tale to the Sheikh of how all his marks had vanished overnight. The old man seemed both surprised and distressed by the news; for he had heard from Doha that the survey was connected with oil and he had hopes that in some way part of the oil royalties would eventually reach him. In fact he planned to spend much time in Doha when the oil began to flow, for he was a relation, perhaps a little distant, of the Sheikh of Qatar himself.

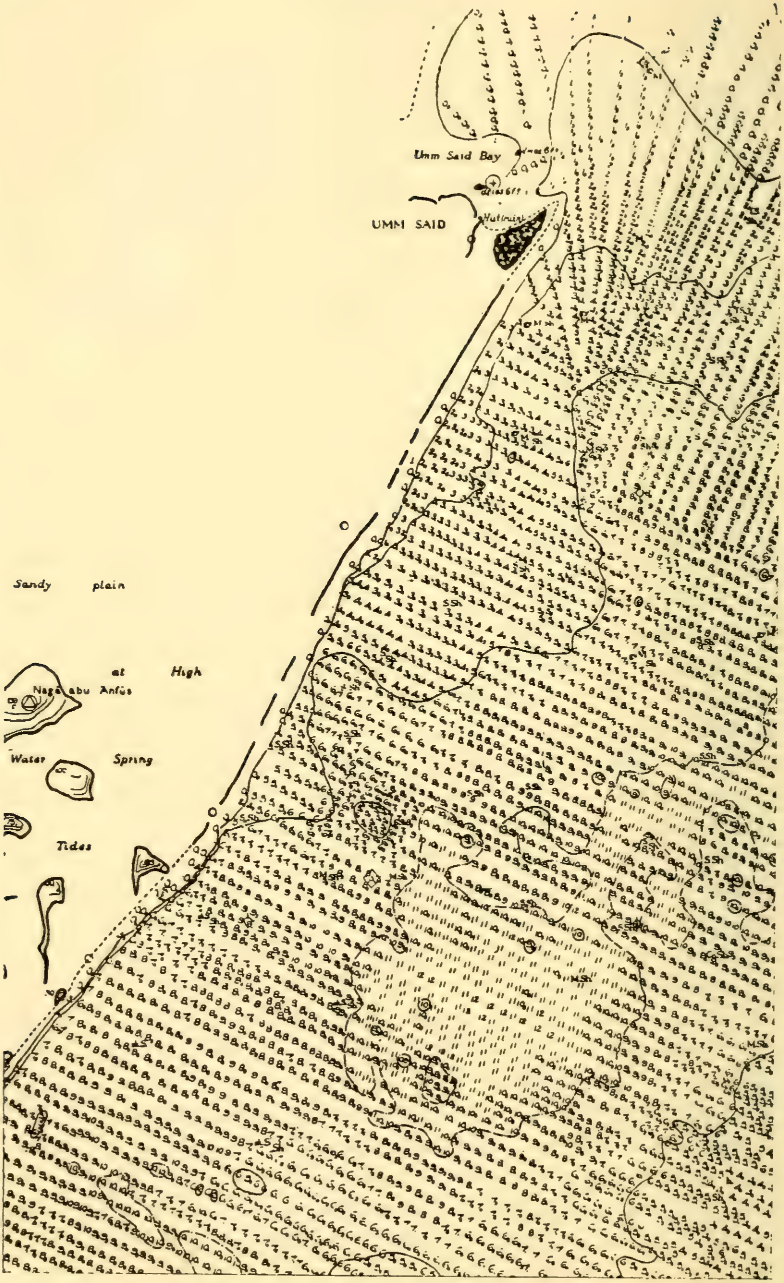
It was agreed that the old man would accompany Ashton on a jeep next day when they would make a whole day's round trip visiting the beduin communities to the north of Khor. As each of these sparse communities was visited the headmen would at once deny knowledge of the stealing of the marks, but Ashton usually caught sight of some piece of naval bunting or wire rope lying unhidden outside the tents. With his cheerful approach to this matter and his readiness to take coffee with those who had so recently stolen his marks, Ashton made a good impression on these people, who slowly produced the missing equipment, which was loaded onto the jeeps. The day spent in travelling from beduin encampment to beduin encampment was a considerable success, for never again did these people interfere with the marks.

The Sheikh of Khor also supplied a small party of ruffians, armed with an assortment of muskets, to guard the camp and they were established in a naval tent on the perimeter. Their guard duties did not lie heavily upon them and consisted of huddling round a fire inside their tent over which they were attempting to make Arabian coffee from the tinned variety provided by naval stores. Two or three times during each night they would cast back the flap of their tent sufficiently to poke a rifle out and fire a shot into the night sky. This caused alarm in the camp on the first night and much running hither and thither by the party to ascertain whence they were being attacked, but it soon became a matter of routine which did not even wake the sleeping surveyors.

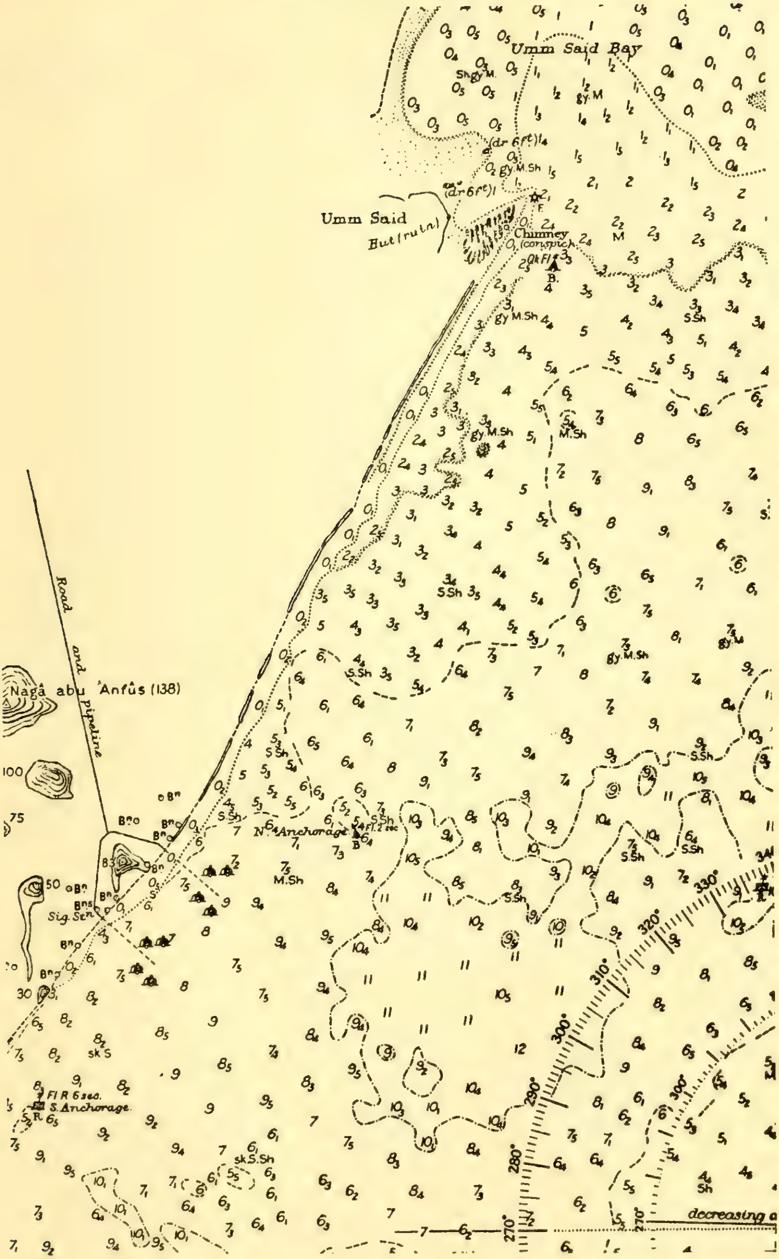
The Sheikh of Khor often came to visit Bill Ashton in the camp and they became very friendly over cups of coffee which Bill made over his small primus stove, which he had brought into camp for this very purpose. In turn he was invited to take roast mutton with the Sheikh. Two whole roast sheep were laid upon a great dish of yellow saffron rice four feet in diameter, and around this the party were seated upon the carpeted floor. With the right hand pieces of meat were torn from the carcasses and eaten with small balls of rice, which were moulded with the fingers. The stomachs of the beasts were stuffed with eggs which the Sheikh pulled out with his hand and tossed to the party; often he and his fellows would tear delicious morsels from the backbone and, sampling them themselves and finding them excellent, would pass them to their guests.

As the mutton cooled it became greasier, and the merit of the coffee which followed was apparent in the cleansing effect it had upon the palate; the wreckage of the feast was then carried to the next room where the so-called slaves and the boys picked it over before it passed to the women's quarters.

Shortly before the camp party packed up to leave, the Sheikh came one night to present a carpet to Ashton. He brought with him two of these, and as it was after dark they were inspected both by lamplight within the tent and by moonlight, so that Bill might choose between the two. When he had made his choice the chosen carpet was slung upon a pole before the tent. In the morning, as Ashton looked out to the eastward he saw the light of the rising sun showing clearly through the several holes that were in his gift carpet. He packed the carpet on the jeep and


Umm Said Bay
UMM SAID
Sandy plain
at High
Naqa abu Anfûs
Water Spring
Tides

Portion of Fair Chart 'Approaches to Umm Said', as surveyed by H.M.S. *Challenger*. Drawn by Lieutenant P. J. D. Hayter, Royal Navy.


Umm Said Bay
Umm Said
Hut (ruin)
Chimney (conspic)
Road and pipeline
Nagâ abu 'Anfûs (138)
N. Anchorage
Sig. Stn
Fl R 6 sec.
S. Anchorage
decreasing

Portion of Admiralty Chart 3787, published 9th April, 1948, from the survey by H.M.S. *Challenger*. The pipeline and mooring buoys at the oil export terminal of Umm Said are shown.

travelled to see the Sheikh and over coffee the offending holes were pointed out. It was with some reluctance, Bill thought, that the Sheikh exchanged the carpet for the other, which by day appeared infinitely superior in that it was intact.

Throughout *Challenger*'s three surveying seasons in the Persian Gulf there had nearly always been one or two men in the sick bay suffering from what was known onboard as coral ulcers. There was much walking upon the coral reefs to be done, both while erecting the triangulation marks and when wading along the reef's edge to delineate it as one would the coastline. On such occasions those who had been walking in the shallows might complain within 24 hours of severe pain as they stood. Soon a deep ulcer would form, usually in the vicinity of or a little above the ankle. Such persons might for weeks be incapacitated and be in considerable pain on setting foot on deck. Surgeon Lieutenant Preston made a study of this ailment and wrote up his findings for the *British Medical Journal*. He found little literature upon the subject although he found the condition well known among the local fishermen and those who had been employed in pearl diving in the Gulf. Wyville Thomson, the scientific leader of the *Challenger* Expedition of 1872–76, had referred briefly to the condition, which had been contracted by sailors from that vessel walking upon the reefs without wearing stout boots.

The corals which form these extensive, almost vertically sided reefs are attached creatures living in great colonies, built up of calcium extracted from sea water and feeding upon small marine organisms. Preston found that in order to secure its food each coral polyp possesses specially adapted outer cells known as nematocysts; these stinging organs contain a coiled thread ending in a dart-like silica head which is filled with powerfully toxic fluid. The whole apparatus is developed in a cell called a cnidoblast which is at one point elongated into a so-called cnidocil or trigger-hair. When this is broken by a passing organism or body the cnidoblast ejects the dart with considerable force into the victim, which is completely paralysed by the rapidly spreading poison.

These darts are probably unable to penetrate the human skin, but when this has been lacerated by contact with the sharp coral, and even when the cut is too small to be noticed, then these poisoned darts enter the flesh and the ulcer soon follows. Stout boots alone were insufficient to arrest the complaint: stout leggings would also be required by the surveyors if they were to remain immune while working on the coral reefs.

On 2nd May, 1949, *Challenger* left Bahrein for the last time, having spent three surveying seasons in the Persian Gulf. She had surveyed an area of many hundreds of square miles and had located a new deep-water oil port and the necessary approach channels leading from the centre of the Gulf to the desolate shores of Qatar, which, owing to the development of the oil wells, were moving rapidly from obscurity to the limelight of strategic importance as each month passed. In addition her boats had surveyed the harbours of Umm Said, Doha and Khor Shaqqiq as well as assisting in surveying the barge routes from Bahrein to the oilfields through the Dohat as Salwa, along which the mass of material for the building of the refinery and the oil township was now being carried.

Much of the offshore work in the last Gulf season was completed with the use of radar, for a suitable set had been fitted during the ship's last refit at Gibraltar. Radar targets affixed to the floating beacons allowed fixes to be obtained regardless of the visibility. But it was still the early days of radar surveying and there were many frustrations and breakdowns of the apparatus and then the traditional methods once again came into their own.

XIV

Cyprus Interlude

As new vessels with modern amenities joined the Fleet, *Challenger* was rapidly becoming old fashioned and life on the mess decks was far from comfortable. As the years had gone by more and more equipment had found its way into the little ship and less and less space was consequently available for purely recreational purposes. The men were messed on an old-fashioned system known on the Lower Deck as 'Canteen Messing', in which each mess plans its own menus according to the meat it has received as its ration from the butcher, and the delicacies it is able to buy at the ship's canteen. The dishes were made up by the amateur cooks in the mess, the only duty of the two ship's cooks being to see that they received the correct treatment when they reached the galley. Life was always something of a picnic as these dishes were served out on the mess deck to the members of the mess. The men longed to get ashore from time to time to eat and drink in more spacious surroundings, and with different company from that of their shipmates with whom they jostled day in and day out in the narrow passages or on the minute quarterdeck which formed their recreation space. In the Persian Gulf this was almost impossible, for Bahrein was the fortnightly port of call, and this being a strictly Moslem state, the men could only get beer, and that only in the little canteen within the naval area where the laws against alcohol were relaxed to this extent.

But each spring, as the weather began to warm up, the last floating beacon was weighed, the camp parties with their jeeps and tents were embarked, and to the delight of every man on-board the ship's bows turned eastwards, barren, humped Jezirat Halul sinking below the western horizon as the ship headed for the Indian Ocean and the long route to the Mediterranean.

The survey of the coasts of Cyprus had been pushed forward slowly for a number of years before the War, this work being thoughtfully kept as a summertime task for the ship which was toiling in the Gulf or the Red Sea.

There are many who love the land of Cyprus with her wealth of ancient buildings, her history, her rocky hillsides darkened by the olive trees, her sparkling blue sea, her snug golden-ringed harbours, her monasteries upon the pine-clad mountains and her independent people; but none could have watched the twin spires of the old cathedral, now a mosque, in the ancient city of Famagusta rising above the horizon with such joy as did the men of *Challenger* as their ship drew nearer to this green oasis, which meant refreshment to them after months spent in the sandy wastes of Qatar.

In spring of 1947 and again in 1948 Sam Southern took his ship into Famagusta. She steamed in past the golden, sun-drenched walls of Othello's Tower, turned to starboard and berthed alongside the ancient, stone quay where lateen-rigged caiques lay with their anchors down and their sterns to the wall as they had done for a thousand years.

To beer-starved sailors Famagusta is a paradise. Cyprus does not appear to be trammelled with licensing laws and the numerous bars and drinking gardens along the main street of Famagusta are ready at any hour to serve cool, quenching brandy sours made from the excellent Keo and Hadjipavolou brandies which are the delight of the sailor. With each round of drinks, plates of 'mezzi' are set before the drinker—tit-bits of goat's milk cheese, onions, cucumber or octopus and a hundred other appetising and thirst-provoking morsels. There the men sat as the warm evening closed in and the kebab merchants set up their crude street stalls and impregnated the night air with the exciting smell of their grilling meat. At this hour the streets were full of people, stepping from the pavements to avoid the family groups seated upon chairs about their doorways, their backs to the street; or stepping back onto the path to avoid the horse-drawn gharries which passed with a gentle jingle of bells and a clap of hooves, or to make way for the overloaded buses which are always on the move in Cyprus, their passengers leaning from the windows and their drivers bent over the wheel as if driving for their lives.

Famagusta made all these months in the Gulf worth it, for the men had saved money there and could now spend at will, and so they moved on with the night to the small, friendly, almost homely cabarets, so different from the garish rooms with their grasping harsh-voiced women which passed for entertainment in Basra.

When the jeeps had been landed and the crew had enjoyed a few nights ashore in Famagusta the work began. For this the ship was based on Limassol in the south-west of the island, and the search for Cyprus Lands and Survey triangulation marks began in the brown cornfields and the olive groves which sloped steeply to the sea.

Enosis never seems to have affected the personal feelings of the people towards us, and surveyors have always found them, both townsmen and villagers, overwhelming in their hospitality. The first day that the Sub-Lieutenant went away coastlining he returned with his board as virgin white as when it had left the chartroom. Sam Southern searched in vain for any indication of the shoreline. 'What the hell have you been doing all day?' asked Sam.

'The villagers where I landed were so hospitable with their wine and food, Sir, that I dared not move off until the boat came back for me in case I hurt their feelings.' Sam's smile was not evident on this occasion.

General Gordon is a serious philatelist, to whom not only is the stamp important but also the postmark it bears; it appeared that the postmarks placed upon the stamps by the rural post offices in the villages of Cyprus were exceedingly valuable. Each officer who landed and set off in the jeep for a day's work with his theodolite in the mountains carried also with him a packet of letters addressed to Gordon. One of these was handed in at each small post office along his route; the General was particularly pleased if his 'postman' would supervise the franking, ensuring that the name of the village appeared as clearly as possible upon the stamp. This game of 'General Post' reached such proportions that it was decided to pull a hoax on Gordon.

The Limassol Post Office conveniently kept a pile of old headed stationery available as scribbling paper so that the less literate could compose their message upon it before committing it to the official telegraph form. A piece of this paper was thus easily obtained and a letter purporting to come from a Mr.

Papadopoulos of the Postal Department was written upon it and sent through the post to the philatelist. Mr. Papadopoulos wrote that he had noticed an increasing volume of letters addressed to Lieutenant-Commander Gordon from the western districts where Communism was taking some hold. This, he went on, aroused suspicions and he reminded Gordon that it was illegal to use His Majesty's Mails for seditious purposes.

There were several officers in the mess when the letter was opened. Gordon read it in silence and his expression became more sullen as his eyes cast down the page. Bristling with rage, he bustled off to his cabin to write a stinker to Mr. Papadopoulos in reply. He told officialdom at Limassol that theirs was a case of unwarranted interference with the freedom of the individual and that if there were any more such accusations he would write to the Postmaster General in Nicosia.

The Postmaster at Limassol was equally indignant and replied that there was no Mr. Papadopoulos on his staff and that as far as he was concerned Gordon could write as many letters as he liked to himself, if that was his particular form of amusement.

Gordon realised now that his leg had been hauled well and truly. But he said nothing, except that the postal authorities suspected a hoax and were instituting police enquiries. A few days later a chance for sweet revenge fell right into the General's lap. He thought that the Medical Officer had been the ringleader of the hoaxers and so when he saw the Limassol Police launch making its way out to the ship at anchor he said, 'Hullo, Doc, here come the police to investigate the postal hoax. I've told them I think you were the instigator.' Doc tried not to appear alarmed, although his heart was thumping, and he sneaked from the quarterdeck before the two policemen came up the gangway. They said they wished to see the Captain and after Gordon had taken them up to the cuddy he went down to tell the Medical Officer where they had gone and inferred that things looked pretty black. The minutes ticked slowly by; Doc said nothing and became paler. At last the Quartermaster came to the wardroom door, 'The Captain wishes to see the Medical Officer in his cabin,' said he. Even Gordon was surprised by this move and the Doctor moved off to face the police.

'Now, you're the Sports Officer,' said Sam as Doc entered the cuddy; 'the Police want to take us on in a shooting match.'

From the heights along the north coast of Cyprus the Turkish mountains may be seen on a clear day. The Hydrographic Department at this time was anxious to fix the position of the Island of Cyprus with reference to the Turkish coast, and this could be satisfactorily achieved by observing angles between the various Turkish peaks from the survey stations along the Cyprus heights. General Gordon was despatched with Geoff Simeon, one of the junior surveying officers, to attempt this task while the ship went down to Port Said to refuel. Geoff was a quiet young man, with a fine sense of humour and an easy-going personality. Later, when Simeon became First Lieutenant of *Challenger* and she re-visited Canada, a friend told the author there that 'Geoff is the most relaxed guy I ever saw.' He had been one of the postal hoaxers, but now he and General set off together from Pyrgos on the jeep with a packet of letters as usual to post by the wayside. They first of all went to Nicosia to visit the Police Department, who made arrangements for them to stay in the police station guest rooms which are provided for visiting government officials, for there are no hotels in the remote villages. Then they motored on across the great dusty plain to the mountains towering beyond and commenced zig-zagging up the hillside roads, which left the cornfields and melon farms behind and passed upward through the olive groves, crossing and re-crossing the mountain streams which were at this time of year no more than a trickle. Rizo-Karpaso on the tip of the long peninsula which forms the north-east end of the island was the first objective, and there they arrived to be welcomed by the constabulary and what appeared to be the whole population of this large village. They entertained the surveyors until an early hour on the roof-garden of the local cinema-restaurant. The staff of this establishment had all at one time or another served in a Soho café or a London night club, and the person who set himself up as the interpreter had only recently returned to this distant sunny village after two years' service in the half-light of the Embassy Club.

In the police guest rooms their companion was Peter, the Customs man. His greeting on arrival in the village had been somewhat different from that which the villagers had given to the two surveyors. He had been showered with stones and abuse, for it was known that he had come to assess the tobacco crop and it was further rumoured that he had invented a machine for extracting small pebbles and other dross from the wheat crop before it was weighed by the government buyers. But such a reception was only that which he had come to expect and he accepted it as a normal part of the Customs officer's life.

For many days a haze lay across the waters dividing Cyprus from Turkey and there was nothing to do but sit in the beautiful garden at the police station which had won first prize in an island-wide contest the previous year. It was tended by a man who was under open arrest and awaiting trial for stealing some poles. The local chief of police prayed that the garden judges would reach Rizo-Karpaso before the visiting magistrate.

The mist did not lift, so the little party decided to move westward and the village turned out to see them on their way. They were made to promise that they would send a message if they were returning so that a sucking pig could be prepared for the occasion. They travelled to Yialousa and then on to Acanthou. There is no police station at the latter place, which has a very great and magnificent church to which pilgrims come from all over the island. The surveyors spent the night in the pilgrim's rest-house in company with a host of bed-bugs. Next day, with little hope of visibility increasing over the sea and with a longing now for comfortable, uninhabited beds, they journeyed on to Kyrenia and moved into Catselli's luxurious Dome Hotel, the bedroom windows of which look conveniently out towards the Turkish mountains.

A slight improvement in the weather a day or so later encouraged the General and Geoff to take to the mountains once more, and after a brief visit to Nicosia to buy more stamps for the letters, and send a message to Rizo-Karpaso that they were on their way, they motored on with the certain assurance that they would have sucking pig for supper.

Unlike Gordon's many letters, the telegram failed to reach its destination and the villagers stared in consternation as the two dusty travellers drove unannounced into the village square. The lack of the sucking pig must be made up for with wine, and the alcoholic reception was soon under way. To this day Geoff Simeon swears that he spent the evening drinking one star brandy and that the General drank ouzo, while the General avers that the reverse was the case.

Perhaps it was not surprising that the mists were still upon the waters when the two surveyors reached the observing station on the mountain next morning. The joining of Turkey to Cyprus had failed but it had been an honourable attempt.

XV

World Voyage Begins

Although not an old ship by many standards, *Challenger*, by the end of 1949, saw her end in sight. Four new surveying vessels had been completed since the War and now there was talk of one or even two newer ships being planned for the Surveying Service. *Challenger* was by far the oldest surveying ship and her end could not be far distant. It must have been pleasing for the old ship to realise, on her return from the Persian Gulf in 1949, that she was to be prepared for something unusual. This was to be a world cruise, and how better could she complete her career than following in the track of her famous predecessor?

It had been planned that *Challenger* should carry out a two-and-a-half-year sounding cruise, visiting the three main oceans and the Mediterranean.

The great number of charts maintained by many of the countries of the world are devoted almost entirely to depicting the depths of the inshore waters on the continental shelf, such charts having navigational value. But since the end of World War II interest in the topography of the deep ocean floor has been growing.

For long such areas had been considered, by those who thought about them at all, as having a flat and featureless sea-bed, carpeted with sediments. But the earlier *Challenger*'s soundings, although she was able to obtain only about 400 of them with her laborious methods of rope and sinker, already showed that there were many features, hills and valleys, on the ocean floor. With the laying of the first trans-ocean cables at the end of the last century there came a steadily increasing knowledge of the features forming the ocean bed, and such knowledge was rapidly augmented by the introduction of echo sounding machines in research and surveying vessels in the early 1930s.

During World War II the neutral Swedes had time to think about oceanographic research, but their practical experiments were restricted within the Baltic; however, soon after the War was over they were ready to take the field of world-wide oceanographic exploration, and, under the enthusiastic guidance and leadership of Professor Hans Pettersen, the now famous *Albatross* expedition set out.

This expedition was following many lines of investigation, including continual echo sounding of the ocean areas to be crossed, but perhaps the most interesting part of the work to the layman was the proposal to obtain cores, or long vertical samples, of the sediments lying on the ocean bed. This was successfully achieved by using the Kullenberg piston corer. The device is lowered on a wire hawser from a winch to the sea-bed, and if the ship is properly handled, a small pilot weight reaching the sea-bed first releases a larger weight which drives the coring tube into the sediment. A piston within the coring tube is attached directly to the wire from the winch, which has been braked as the bottom is reached. The piston thus remains still while the tube goes into the sediment. The partial vacuum so formed assists the sediment to enter the tube. The resulting core samples of the ocean floor sediments can be seen in plastic containers giving a cross section view, the sediments seen at the lower end of the tube having been laid down hundreds of thousands of years before. The differing colours of the predominant sediments, whether it be fine wind-blown sand or the calcerous skeletons of countless plankton forms, when viewed as it were in cross section give the impression of looking at a layered cake having an infinite variety of cream fillings.

The *Challenger* cruise being planned in 1949 aimed at taking a very considerable number of soundings in the oceans, as well as carrying out searches for a number of shoals reported in such areas, particularly in the latter years of the War when thousands of ships were running their echo sounding machines—many of the operators interpreting their sounders correctly while others 'discovered' shoals which never existed.

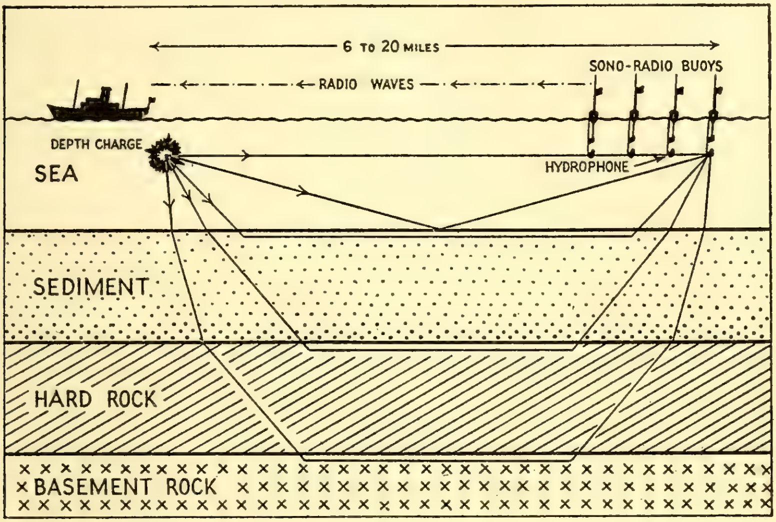
At the same time it was arranged to take a small party of scientists from the Department of Geodesy and Geophysics, Cambridge, to explore the structure of the ocean bed itself. This was to be done by using seismic refraction methods already in use on land but now adapted for use from a ship with over 2600

CHALLENGER'S
ECHO SOUNDING
LAUNCH—
WINTER
HARBOUR,
VANCOUVER
ISLAND

Photo:
C. J. Whybrew,
L.E.M., R.N.

COMING
ALONGSIDE—
PEARL
HARBOUR

fathoms of water separating her from the ocean bed. To carry out such experiments a ship must be fitted with special apparatus.



A seismic refraction experiment, showing the paths by which various sound waves travel from explosion to the hydrophones

A comparatively flat area of the ocean bed having been found, four sono radio buoys are laid about half a mile apart. Each buoy has a hydrophone slung beneath it in the water and within the buoy itself is a receiver and transmitting wireless set, with batteries. An aerial is carried on the buoy's mast. Having laid the buoys, the ship moves off to a distance of eight miles or so and fires a depth charge. This forms a source of sound which travels out in all directions in the sea.

One path of sound travels horizontally through the water to the hydrophones below the buoys whence it returns to the ship as a radio signal. An accurate timing device in the ship records the time of the firing of the depth charge and the returning signal from the buoys. The speed of sound in sea water is known (5000 feet per second) so that a range of the buoys has now been found.

Other paths of sound lead towards the sea-bed and then horizontally through the layer of sediment. As this sound passes beneath the buoys it can be picked up through the water by the hydrophone and again a signal is sent to the ship. The depth of water both beneath the buoys and beneath the ship has been found with the sounding machine, and the time of the passage of sound from the ship to the sea-bed and from the sea-bed to the buoy hydrophone can be calculated. This time is subtracted from the total time for passage of sound, the resulting time being that taken by the sound to pass horizontally through the sediment layer for a distance of eight miles, so that the speed of sound in the sediment layer has been discovered.

Yet other paths of sound pass through the sediment layer to the harder, more compressed layers beneath, in which sound travels more quickly. The time of the passage of sound through these lower layers is also timed, and a speed of sound for these layers found. When the speed of sound in a material is known then geophysicists get a pretty good idea of the type of rock forming this material, relating it to their experiences on land where borings can be made and samples of the material inspected after measuring the speed of sound by seismic methods.

By carrying out these seismic refraction experiments at a number of increasing ranges from the sono radio buoys, and knowing the speed of sound in the material forming the layers, the vertical thickness of the layers may be measured.

Thus a picture is built up of the types of material which form the layers of the earth's crust beneath the oceans, and such experiments, carried out at a number of different positions in the various oceans, can be seen to be complementary to the researches of the *Albatross* regarding the sedimentary layers.

In the winter of 1949–50 *Challenger* lay in Chatham Dockyard, enduring the usual discomforts of a refit and preparation for another voyage. The crew were joining in twos and threes as they were appointed from Portsmouth Barracks. They were living in Chatham Naval Barracks and marching to the ship both morning and afternoon, never a popular part of the commission, more particularly on this occasion, as the men were from Portsmouth Division, where *Challenger*'s crew always came from: so that after a day spent in the unheated store-rooms and in offices with scuttles missing and rain dripping through the empty rivet holes, and after being maddened by the roar of pneumatic riveting hammers and the general frustrations of working in a ship 'in dockyard hands', the men had no prospect of home comforts at the end of the day.

The crew for this world voyage were volunteers and were anxious to be away, but the inevitable delays took place and week after week the sailing date was postponed. Soulsby, the Leading Sick Berth Attendant, who proved to be quite a wit during the voyage, requested to see the Captain for a 'foreign service draft'. Petty Officer Greenshields was once more onboard *Challenger*, this time as the Senior Recorder.

When one reads the accounts of voyages of scientific exploration it is seen that naval officers and scientists do not often see eye to eye on all things, particularly at the beginning of a voyage. This is not really strange, as the naval man's ideals are usually a definite programme to work to and a ship of a smart and seamanlike appearance. A concession on both these points has to be made to the scientist if the advantages of good weather and of locating an interesting area are to be seized, and if scientific equipment, assembled with labour and enthusiasm, is to remain in position despite its unseamanlike appearance.

Tom Gaskell and John Swallow, the scientists who sailed in *Challenger*, were both outstanding in their way, although completely different in outlook. Tom was hard-working in the extreme when he had work to do, but when his experiments were complete and his records made up, then he would enjoy life as few others can; his enthusiasm for every new project was unbounded and carried others along with him. Whenever one did anything with Tom he made it seem really worth while doing. He was an inveterate sightseer in the scientific field or any other: as the voyage went on his cabin became fuller and fuller of souvenirs which he picked up at every port of call. John Swallow was serious, never happier than when he was working on the results of his experiments, and he was intensely interested in all forms of science and in natural history. John could relax, however, and when he started mixing highballs a good evening lay ahead. He was a good trencherman and was to uphold the ship's reputation when faced with giant steaks in the restaurants of Victoria, B.C.

John Swallow's arrival did not portend good relations between the naval and scientific staffs. It was the week-end, and the First Lieutenant had given leave to a large number of the crew, leaving only a small fire party of about half-a-dozen men onboard. He had also decided that on that Saturday it would be appropriate to give a small farewell luncheon party onboard for a few of his friends. The gin had been enjoyed and the party were about to be seated around the luncheon table. The calm of a 'make and mend' had settled on the ship, when the quartermaster announced the arrival on the dockside of a Mr. Swallow, who had driven up in a huge vehicle loaded with about a dozen sono-buoys and associated equipment. So what was to have been a quiet and pleasant afternoon was busily employed in embarking the scientist's apparatus.

By May all was ready and *Challenger* set out from Chatham on the first leg of her journey. Bermuda was the first port of call, and was in fact used as a base for three cruises into the North-West Atlantic. On the last of these cruises *Challenger* ran for her life. The author had only recently joined the ship and this was his first voyage in command, for he had taken over in Bermuda from Commander Bill who had been taken ill there and had returned to England. *Challenger* sailed northward over the Great Newfoundland Bank and on into the North Atlantic. She was intending to stay at sea as long as possible to carry out investigations before returning to Bermuda for fuel. This is a risky business in a low-speed ship in the hurricane season, and after steaming southwards for some days on her way back to Bermuda a hurricane warning was received. Before the last war, the first a ship often knew about a hurricane was the falling of the barometer and the presence of an ominous calm. Today, at the suspicion of a circular storm forming in the hurricane breeding area, which lies eastward of the West Indies, United States 'planes search for and locate the storm, which, if it proves to be a hurricane, is given a girl's name and assumes a personality. The storm is followed daily by the patrol 'planes, which often fly boldly through the storm, fixing their position and estimating their course and speed, until the hurricane enters the mainland of the United States or peters out in the North Atlantic.

Such storms usually set out in a north-westerly direction and if they do not reach the mainland turn slowly northward and then north-eastward, when they are said to have 'recurved'. Bermuda often finds itself in the hurricane area at the time of recurving.

Some ships have of course passed right through the centre of a hurricane, experiencing winds of well over 100 miles an hour and mountainous seas. Such ships have often lived to tell the tale, usually with calmness and much understatement, one feels, when reading these accounts in the meterorological journals. But well-found vessels have gone to the bottom as the result of meeting with a hurricane or a typhoon at sea, often as a result of a giant wave pouring down the funnel, as the ship is tossed madly in a confused and towering sea. So it is well to avoid these circular storms if one can, and this is difficult of accomplishment in a low-speed ship.

On this occasion the hurricane was reported coming northwards between Bermuda and the coast of the United States. Her name was Doris. A little later she was reported to be recurving and then to be moving in a north-easterly direction. *Challenger* was just south of the Grand Banks and the Captain and Navigator had decided to head due westwards and later southwards towards Bermuda, getting round behind Doris. But as the next 12 hours wore on the feeling of ominous calm became gradually apparent, and by evening, as the ship sailed westwards into the setting sun, it was unmistakable. Cirrus clouds stretched in wispy bands right across the sky, and lower cumulus clouds cast leaden shadows on the glassy surface of the gently heaving sea. A flock of storm petrels fluttered in the wake of the ship, which was flanked by the waves caused by the ship's bows rippling outwards on either quarter as far as the eye could see.

Those on the bridge were not surprised therefore when a signal was passed up which said that the last report of Doris's movements had been in error and that in fact she was still proceeding northwards. A simple sum in relative velocity showed that ship and hurricane would eventually meet.

The course was altered to the south-east and *Challenger* began to run a little faster, at her maximum speed of about ten knots. For two or three days *Challenger* hustled south-eastwards and was by now approaching the latitude of Bermuda, and she began edging to the westward in heavy seas in Doris's wake.

About this time the Wardroom invented a game called 'Ships and Hurricanes'. It was played on a squared board with the goal, Bermuda, in the left-hand bottom corner. One player, representing the ship, dodged this way and that, being countered in turn by the hurricane, the other player. A thrown dice gave the number of squares which could be moved. The Captain, when he visited the Wardroom to play the game, was depressed by the number of times that the hurricane was able to keep the ship from reaching Bermuda until the ship's fuel, represented by a certain number of dice throws, ran out. The game seemed more and more like the efforts being made on the bridge to reach Bermuda—a tiny speck in a vast ocean defended by a hurricane; and when a second hurricane was reported and it too was represented by a counter on the game board, the Captain's visits to the Wardroom abruptly ceased.

The second hurricane, Effie, was travelling northwards towards Bermuda at a steady ten knots and a course alteration was required in *Challenger* to come into Bermuda from the south behind Effie. But about 150 miles south of Bermuda Effie came to a grinding halt, and Bermuda signalled that conditions were unsuitable for a ship to enter through the reefs owing to the strong winds and high seas caused thereby.

Challenger's fuel was now very low owing to the great amount of dodging this way and that, and now Effie's action in pulling up seemed almost human in its malevolence. The seas were very high as the ship steamed slowly into them, playing for time. The small party on the bridge gazed upwards with awe at the oncoming wavetops towering above them: some said the waves were 60 feet high, some 70, but waves are deceptive and now that a wave recorder is fitted in a British Weather Ship it seems that waves are often over-estimated. A wave of 50 feet in height would be an exceptionally high one in the North Atlantic.

After three weary weeks the oil fuel tanks were nearly empty; they were filled with sea water to maintain the ship's stability. *Challenger* fought her way on, using the fine oil supplied for the lighting diesel.

At this point the Captain sent a signal describing his plight to the Commander-in-Chief of the Station, who was at the time visiting a South American port in his flagship: there was nothing that he could do, but before a hurricane caught *Challenger* without fuel and toppled her over it seemed that someone should be told. But the C.-in-C.s reply, which simply said 'Good Luck', produced quicker results than many a longer operational signal. Almost at once Effie began to move northwards, and as signals reporting this movement came in *Challenger* moved slowly forward in her wake. Effie's influence gradually cleared from Bermuda and *Challenger* steamed in on the very last of her fuel. The beach felt good that night as the men stepped ashore for a 'run'.

Sounding and seismic work had gone on whenever the weather allowed it during the ship's cruises from Bermuda, but once the winds reach Force 4 on the Beaufort Scale so much 'water noise' is caused by the sea slapping against the buoys that the signals cannot be distinguished and seismic experiments are discontinued. This is a frustrating business; the buoys laid in calm weather may have to be lifted in an hour or two as the wind increases. There are other frustrations too, such as the day a shark swallowed and made away with the scientists' favourite hydrophone as it was being hauled onboard. Further dropping of charges must have caused the shark considerable indigestion.

A visit of five days' duration to Kingston, Jamaica, was memorable for the heavy and incessant rain which fell throughout the stay. As at so many other ports visited, the local people said that it was the worst weather they had known for years. It is ever thus.

The visit was also memorable for four inexpensive nights of pleasure at the 'Glass Bucket', the swellest joint in town. Here Kitty, a dusky beauty, was prepared to roll dice against the patrons on a semi-circular green table behind which she sat with inscrutable expression. The game consisted in the patron backing a certain number to come up twenty times during ten throws of five dice. Seeing that the numbers on the dice were scalloped out of the surface the philosophers stated that it was likely that, as the sides bearing the higher numbers must be lighter as a result, then five and six would be good bets. And so they proved to be, giving the *Challenger*'s men a pound back for five shillings on nearly every occasion on which they played. But on the last night Kitty sat, inscrutable as ever, before a brand new set of dice on which the numbers were painted and not scalloped. The management of the 'Glass Bucket' had found the flaw in their system but the ship had had a good run.

Passing through the Panama Canal in October, 1950, *Challenger* sailed northward in the Pacific towards San Diego. For the last five days' steaming before reaching San Diego the 'deep scattering layer', as it is called, was seen at dawn and dusk on the echo sounding machine. This is a common phenomenon in the oceans and appears on the echo sounder as a false sea-bed echo. The layer spends the day at about 200 fathoms, ascending steadily through the water at sunset until it has reached a depth of 20 fathoms or so, where it spends the night, and whence it returns again just before sunrise to 200 fathoms.

The layer may be caused by countless millions of tiny animal plankton forms, hard-shelled, and known as euphausiids. These animals, which, with many similar types, abound in the oceans, are known to migrate towards the sea surface at nightfall. But the echoes seen on the sounding machine may be coming from vast numbers of fish which live in the deep ocean and are feeding on the migrating plankton: such fish have air bladders and may be a cause of the echoes being reflected. This may be the answer, possibly combined with other, unthought-of, factors, and as one watches the unbroken layer hour after hour on the sounding machine one thinks of the wealth of life within the oceans.

At San Diego a very brief visit was paid to the Scripps Institute of Oceanography, a department of the University of California. From here, under the leadership of Dr. Revelle, the Director, four great oceanographic expeditions have sailed out into the Pacific since the close of the last war.

At Scripps the recent scattering layer records were being discussed and one of their biologists investigating the cause of this layer suggested that *Challenger* should take one of his depressors, which, attached to a plankton net, would keep it at a constant depth as the net was towed through the layer to capture specimens of the plankton. The depressor was of brass, heavy, and of an intriguing curvaceous shape. The inventor said that the inspiration had come to him when contemplating his attractive secretary. The party from *Challenger*, looking across the room to where she was sitting, saw what he meant.

Three months were spent working off the British Columbia coast, using many of the small anchorages along the coasts of Vancouver Island and the Queen Charlotte Islands.

For two or three days the ship lay at anchor in Heater Harbour, a little fjord-like anchorage lying between steep wooded hills, on the east coast of Kunghit Island at the southern end of the Queen Charlotte's. Deer abounded on this island and could often be seen on the beaches in the afternoon and early evening. They appeared to be feeding on the seaweed. Small parties of the ship's company would land in the afternoon to try to get fresh venison, and on such occasions were warned not to enter the bush. Thick forests of sitka, Douglas fir and hemlock came right down to the water's edge. Beneath these stately trees lay a jumble of fallen trunks and boughs, rotting stumps and thick undergrowth.

At 5 o'clock one evening, when the boat went ashore to collect four stokers who had been ashore on such an expedition, only two of the men were on the beach. The other two were said to have entered the woods and had not been seen again. Until dusk cries of 'Hope' and 'Abel', the names of the missing stoker mechanics, rang out from searchers along the shore.

Although snow lay on the ground, the afternoon had been mild and these hunters from the boiler-room were lightly clad. The wind increased in the night, snow was falling and the temperature was well below zero. All thoughts onboard were with the two lost in the Canadian forests, and it was long before dawn when the first men were 'wetting tea' in the galley and preparing to land as search parties.

A full gale was blowing when a party of over 40 men, with the First Lieutenant in charge, were landed to search the woods; this was now Geoff Simeon, 'the relaxed guy', who like so many others in this tale had returned once again to the old ship. By noon he was back onboard to report that the woods were so thick that he was in danger of losing members of the search party. Without a compass, one lost all sense of direction in these forests, and what was needed was a number of small parties, each in charge of a leader with a compass.

The lost stoker mechanics had landed on the north side of the harbour, the land here being a peninsula about half-a-mile wide, the northern side of which looks out across a broad sea channel between Kunghit Island and Graham Island, the next land to the northward. The northern coast of the peninsula was searched by boat, while small search parties, keeping only a few yards from their leader, fought their way across the peninsula at maximum speeds of about 400 yards an hour, so tangled and matted was the undergrowth and so frequent and deep were the potholes left by old decayed tree-stumps.

The second day ended without results and by now all onboard were seriously worried as to whether their two shipmates would survive a second night, ill clad as they were in light overalls, with freezing temperatures, high winds and falling snow.

There is on Kunghit Island an abandoned whaling station, shown on the charts. It lies on the north coast of the island but considerably to the west of the limit of the north shore already searched by boat. On the third day it was decided to send a boat to the old whaling station, in the faint hope that the wanderers had found shelter there. Meanwhile the search parties returned to the woods, searching to the westward.

About noon the wireless operator ran into the Captain's cabin. A message had been received from the boat by R/T—Hope and Abel had been found, and the boat was on her way back to the ship.

The First Lieutenant had been in charge, and as soon as he landed on the ruined jetty at the whaling station he saw footprints in the snow and called out the now familiar names. A thin answering cry came from one of the tumbledown huts, and there, too cold and weary to stagger out to meet their rescuers, were the two men.

They spent about a week in the sick bay and after a painful interview with the Captain, who took the odd view that they had been absent over leave for two days, they told their messmates of their experiences. They had entered the woods for only a few yards before losing their sense of direction. They spent the first night huddled under a fallen tree, scared by the howling of wolves; as no wolves are known in these islands, it must have been the ship's siren that they heard, which was sounded at intervals to assist them to locate the ship. Hope was interviewed by Soulsby on the ship's internal broadcasting system. When asked if they had considered eating berries to nourish themselves, Hope replied: 'No—I gets my food at the shop on the corner.' So answered an English townsman after being lost in the Canadian backwoods.

Among other places visited in British Columbia was Port Simpson in the extreme north. This is a fine but little-used anchorage, with a township inhabited by Indians of the Tsimpsean tribe. A Hudson Bay Company store is run by two white men, and one or two other white families live close about the store in wooden frame houses. A white minister serves a somewhat difficult flock.

About 30 of the men of *Challenger* enjoyed this place and quickly made friends among the Indians, who arranged dancing and games in the local hall almost nightly. There were no other amenities in Port Simpson except the 'diner', which consisted of the living room of a house with 'B.C. Diner' painted on the front door; within this room was a wood-burning stove which was always red-hot, and coffee was brought from the back room to the customers clustered round it. Outside all was crisp and crunchy with snow.

A sacred concert in the village hall was the highlight of the ship's visit. A silver band played hymns and sacred songs, sometimes on their own and sometimes accompanying soloists or mixed choruses. Many of the hymns were dedicated to the men of the ship, and finally an elderly Indian woman dedicated 'Into Battle' to the ship herself, a somewhat inappropriate hymn for unarmed and peace-loving *Challenger*.

A small band of beautiful young Indian girls hung over the rails of the balcony, but the Chairman whispered into the Captain's ear that at least two of the girls had been run out of town for their moral lapses and should not now be gracing such a solemn occasion.

As the evening came to an end a finely painted wooden paddle was presented by the Indians to the ship. This paddle had magic properties—if the ship broke down or ran short of fuel, no matter how far from land, the magic paddle could be used to take her to port. This was a source of comfort to the Engineer Officer for the rest of the voyage.

In 1908 the British surveying vessel *Egeria* had surveyed the fine bay at Port Simpson, and *Challenger*'s Captain heard that Sam Bennett, an old Indian, who had acted as a local pilot in the *Egeria*, was still living at Port Simpson. With the Minister's help a meeting was arranged in old Sam's wooden house by the shore. Sam Bennett had been blind for many years, but he remembered the happenings in the old days in *Egeria* and described them as if they had occurred yesterday. He told his visitors where to find his Bible and guided them to an old ship's company photograph still between the pages. There was Captain Learmonth, the officers grouped around him in their old-fashioned small-topped uniform caps, the men ranged behind them. The inevitable small dog lay on the deck in front of the group, and at one side proudly stood Sam Bennett, the local pilot.

Things have changed little in many ways in the routine of a surveyor's day. Sam described the early start in the mornings, the boats going off from the ship in all directions, the climbs through the woods, the clearing of the hilltops, the erection of flags and the long hours spent around the theodolites. In those days, as now, the ship's doctor found time heavy on his hands as the fit men manned the boats or climbed the hills, and Sam Bennett told how he had taken the Medical Officer deer-hunting. He described how he had led him unerringly to a fine coast deer, the breathless minute as the doctor took aim, and how he had skinned and carved up the deer, packing it in its own skin and carrying it onboard on his back.

Coming south from Port Simpson the ship travelled down the long fjord-like passage between Vancouver Island and the mainland, which at its narrowest part passes through Seymour Narrows. These are made more hazardous by having a dangerous submerged rock in the channel and strong tidal streams swirling past it. A vessel of *Challenger*'s modest power must wait for slack water to make this passage between the hidden rock and the steep snow-clad mountainside.

Whilst navigating the inner route the ship spent a night at Alert Bay, a trading port on one of the small islands lying in the channel; a fine forest of Indian totem poles and a processing works for turning herrings into fertiliser are the two most memorable features of this little place. There was also, of course, a beer parlour, and it was here that the Petty Officer Steward and three shipmates made arrangements to get some herring. When the boat went off to the ship that night at midnight all that had to be done was to take the boat underneath a shute which overhung the water and their new-found friend, who worked in the herring factory, would release a small quantity of herring into the boat. As the evening drew on, the idea seemed a very excellent one to the four P.O.s and they thought how much the whole ship's company, from the 'Old Man' downwards, would enjoy their meal of fresh herring. They collected a number of cardboard beer cartons to carry the fish.

The coxswain of the boat seemed strangely unenthusiastic and the P.O.s had to assert their authority to make him take his boat under the shute. The new-found friend had also indulged in the parlour and having once released the stream of herring he was unable to stem it despite the shouting of those in the boat below this fishy waterfall. The fish poured into the open compartments of the boat to a depth of two feet or more before the coxswain could cast off and get his boat clear. When the boat reached the gangway, the Officer of the Day could hardly believe his eyes, nor could the Captain, who was roused from his sleep by the shouting and argument which accompanied the inefficient methods the P.O.s were employing to bring the fish up the gangway in the slippery cardboard cartons, which were collapsing and showering herring in every direction. The bowman stood disconsolately in the forepeak, knee deep in herring, while he held the boat's bows in to the ship's side.

It was a difficult morning for the First Lieutenant, who had to forget the three fresh herrings he had enjoyed for breakfast when he confronted the four P.O.s and ordered them to scrub out the boat which hung miserably at the davits, so covered with fish scales that she appeared to be under snow.

Christmas 1950 was spent in Victoria, where this festival is celebrated in the old-fashioned way. The trees are easy to get from the woods and on Christmas Eve everyone is out visiting everyone else, carrying gifts to the Christmas trees.

A 'friend' of the ship put a personal advertisement in the local paper to the effect that *Challenger*, whose badge is a challenging stag, wished once again to have antlers on the fore side of her bridge as she had had in her Labrador days. There are many hunters in British Columbia, amateur and professional, and a new and better pair of antlers replaces from time to time the pair hanging in the front hall. The relegated pair goes into a back room. Hunter's wives could hardly believe their eyes when they read of the opportunity to be honourably rid of their junk. For a week around Christmas time, with the spirit of giving in the air, every car and every van that pulled up on the quayside alongside *Challenger* carried a load of antlers.

With a fine pair of caribou horns in front of the bridge, with every member of the ship's company possessing a pair of antlers, and with the biggest stuffed stag's head over Tom Gaskell's bunk, the ship sailed southwards towards the islands of Hawaii.

XVI

The Pacific

The pilot who boarded the ship off Pearl Harbour was just what one might have expected. Instead of the drab figure who boards a ship for this purpose in most parts of the world, this man was colourfully dressed in a gay aloha shirt, palms and hula girls entwining themselves against an orange background. He wore a cap more suitable to a jockey than a man of the sea and he leapt from his fast-moving launch with the agility of a trapeze artist. Once on the bridge he said, 'Let's go, Captain.' and soon the ship was steaming at her best speed through the man-made passage in the coral reef which leads into the extensive lagoons which now form Pearl Harbour, the greatest naval base in the Pacific. She passed giant aircraft carriers and fleets of destroyers moored alongside. The sound of orders, oddly phrased to British ears, carried across the water as the boatswain's mates passed them over the loudspeakers.

It is fashionable for travellers to say that Honolulu is over commercialised and that there is little pleasure to be had there, but with its delightful climate and colourful people there is still much of interest and enjoyment.

The ship was welcomed alongside by a party of Hawaiian girls dancing the hula on the dockside and accompanied by a small orchestra playing the music which is so much a part of life in these islands. That this entertainment was laid on by the U.S. Naval Welfare Services and that the girls danced where they could among the thickly parked automobiles detracted little from this Island Welcome and the sailors' eyes were not upon the berthing wires which they were handling.

The Captain's first task was to call upon the U.S. Admiral Commanding the Hawaiian area and so he landed in full white uniform, buttoned close up below the chin, as British naval tradition demands. On this warm day he envied the Admiral in his open-necked khaki uniform shirt and his rolled sleeves as he sat at his desk. 'Sit down and relax, Captain,' said he. 'Why, you sure look all trussed up in that outfit.'

Hot sun tempered by cool breezes endured throughout the week's visit. The days were spent in visiting the Bernice P. Bishop Museum where Sir Peter Buck, the Maori anthropologist, presided over the finest collection of Polynesiana; or in attending a scientific symposium to which the Captain and the Senior Scientist went smartly dressed in their Palm Beach suits only to find that from the Chairman downwards the delegates were attired in aloha shirts. It was refreshing to see an elderly scientist of serious aspect dressed thus as he propounded his theories relative to the height of the water-table on the Island of Oahu.

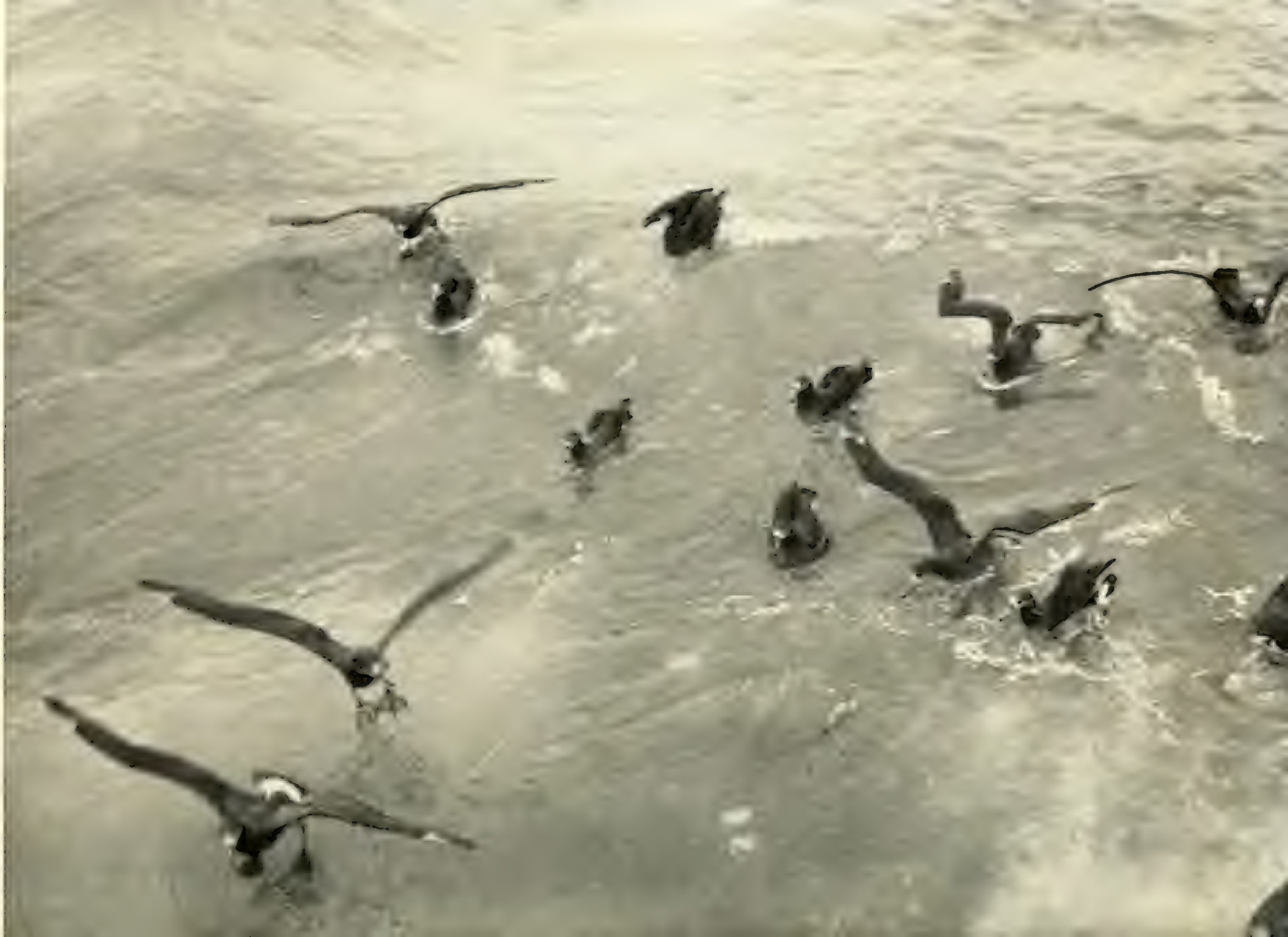
It is on the Island of Oahu that both Honolulu and Pearl Harbour are situated. A party of scientists and officers flew from Honolulu to the Island of Hawaii to visit the volcano observatory on the rim of the crater of Kilauea. This was following in the footsteps of the earlier *Challenger*, from which a similar party had landed at Hilo, the capital of the Island of Hawaii, and from there had 'a tedious and monotonous ride' on horseback across 'a weary expanse of open country devoid of any fine trees' to reach Kilauea, taking the whole day to get there. *Challenger*'s party, alighting from their plane, soon crossed this gently rising landscape in a hired car, belonging to Mr. Ducky Goo. They did not see the lava fountains in the crater which their predecessors had described, but they were able to see the lava flows from the eruption on the slopes of the higher Mauna Loa which had occurred about nine months previously, and which had lasted for 22 days, when 600,000,000 cubic yards of lava, the largest quantity recorded in historic times, was disgorged upon the mountainside.

There are today a volcanic observatory and five stations around the crater at Kilauea, which are fitted with apparatus to determine the tilt of the ground in both north/south and east/west directions, and these, together with seismographs which record both small and large earthquakes, give indications of impending trouble. As a result of increasing tilt and a number of daily earthquakes a warning of volcano eruption was published in the local paper on the day before the outbreak of lava on the slopes of Mauna Loa.

Even nine months after this eruption the lava was too hot just below its surface to handle for long, and warm pieces of so called

HEAVY WEATHER—
NORTH PACIFIC

BLACK-FOOTED ALBATROSS ALONGSIDE THE SHIP—NORTH PACIFIC



'Ah' lava were carried back to the ship. Six different flows had poured down the mountainside and the party were amused to see that a house which had been missed by only 50 yards was now up for sale.

Fine weather endured for some days after leaving Pearl Harbour, and the ship's philosophers, refreshed by their scientific and social contacts in Honolulu, turned to their seismic experiments with renewed vigour. But the course was northwards for Adak, a U.S. Naval Base in the Aleutians, and after a week or so the weather grew more stormy daily until the ship passed through the chain of the Aleutian Islands in a gale of great ferocity, cold northerly winds shrieking in the rigging and over the top of the bridge where the Officer of the Watch huddled in his corner and peered over the windbreak at the cold white scene of countless breaking seas joined by wind-blown streaks of foam which stretched away on either hand to the snow covered mountains of rugged aspect. Two or three Black-footed Albatross, still attendant upon the ship, were sweeping across this seascape like leaves in the gale, the only dark coloured objects in a grey-white scene.

Although the country was bleak and snowbound the U.S. Naval hospitality made up for everything, the few days spent at Adak passing quickly, and once again the ship was at sea on her way to Japan.

Day after day, week after week, as the ship sailed in the North Pacific the sky was overcast, the visibility was down to a mile or so and winds of gale force kept the seas high and the ship's motion violent. Ocean sounding was all that could be done on such days although water temperatures and samples at depth were taken with the reversing water bottles whenever the weather moderated. But the sono-buoys lay snugly in their stowage and the scientists cursed their luck and once again went over their records made on calmer days.

There was one activity, however, which never ceased by day and that was the watching of birds. Except in the tropics one cannot sail for long unaccompanied by seabirds. In the more temperate zones there are always birds in attendance or to be seen flying past from time to time. At regular intervals the birds in sight were logged and as the cruise progressed sub-arctic, subtropical and tropical avian communities were encountered. There are many seabirds which, unlike the coast-loving gulls, spend the whole of their lives, except for the nesting season, at sea far from land. Such are the Black-footed and Laysan Albatross which attended the ship throughout her time in the North Pacific, although they never followed *Challenger* west of the Nanpo Shoto Islands which lie in a chain running southwards from the vicinity of Tokyo Bay. The Black-footed Albatross were very numerous and very curious. They insisted in clustering daily about the wooden float which supported the 1¼-pound charge the scientists drifted astern. When exploded, this charge gave a signal which penetrated the sediment layer of the sea-bed, and returning after the bottom echo, gave a thickness of the sediment on the ocean floor beneath the ship. Despite considerable patience in waiting for the birds to lose interest in the float it was sometimes necessary to fire the charge while they still clustered round and inevitable casualties resulted.

There are three species of albatross known to the North Pacific as against about a dozen species known in the Southern Hemisphere. The birds have only been known to cross the Equator on very rare occasions, and even these may have been carried across as captives in ships, for they are fairly easily caught at sea with a fishing line and hook baited with a piece of fat. The albatross, like most other oceanic seabirds, is very susceptible to the changing temperature of the sea, and does not follow a ship far outside the zones of his preference. It is probably the type of plankton food living in such waters that limits the bird's travel rather than the change of sea water temperature itself.

Oceanic birds can therefore be regarded as tell-tales for the changes of temperature, and hence ocean current boundaries, thus systematic watching of the birds while travelling across the oceans forms a useful type of oceanographic observing. It is a pleasing occupation to watch the petrels as they skim endlessly and effortlessly between and over the wave crests to windward of the ship and to try and pick out this or that peculiarity of colour or profile which will serve to identify the species. Alexander's *Birds of the Ocean*, well thumbed and whitened with salt spray, lay to hand on the bridge chart table.

One day in the North Pacific, when the ship was about 250 miles eastward of the coast of the main Japanese Island of Honshu, an albatross of unfamiliar appearance circled the ship and settled upon the water, folding its long wings, which, so graceful when the bird is in the air, appear unwieldy and out of proportion as it gathers them to it after landing. The bird was white above and below but with brown wings and a white back, and, most noticeable, a yellow-tinged head and neck. There was no doubt in the observers' minds that this must be the Steller's Albatross, named after Behring's naturalist. John Swallow was sent for with his camera, but before he was on deck the bird had taken wing, waddling at first across the surface of the sea, wiggling its stern in a most laughable manner. But once the last wave top was cleared the legs were snugged away, the wings set, and the bird became at once a thing of effortless beauty as it sailed away into the mist.

Experience with albatross told the watchers it would probably return again to the vicinity of the ship, so Swallow stood by with his camera, and two hours later the bird was sighted coming in low over the wavetops like an enemy torpedo plane. This time the bird circled the ship again and again, never very near, but close enough for John with his telescopic lens; his photos show sufficient evidence for ornithologists to say that *Challenger* had undoubtedly sighted this rare bird which had been thought extinct by some authorities for fifteen years or more. The story goes that the Japanese fishermen had been in the habit of killing these birds while they were at their nests on the Izu Islands. Here they were easily caught, for they need a long run to become airborne. Their downy feathers brought a good price in Japan in those days for use as stuffing for pillows and mattresses. Hearing that legislation was being prepared to protect these fast vanishing birds the fishermen struck first and cleared the few remaining birds once and for all, it was thought, from the face of the earth. Perhaps there is still a hope of revival for this much persecuted lovely, lonely bird of the North Pacific.

The hundreds of fishing and other small craft met during the day's steaming through the Inland Sea to reach Kure, on the island of Honshu, made the *Challenger* aware how much Japan is dependent upon fisheries and how much inter-island traffic is required for the every-day running of the country. Kure is a former naval base; the wrecked shipyards and the giant graving docks, then fouled with wreckage, bore witness to the former greatness of this port where Japan's largest battleships were once built.

Tom Gaskell, the inveterate sight-seer, was soon active in Japan and he and the Captain crossed the Inland Sea in a local ferry boat for a few days' holiday at the watering spa of Dogo, near Matsuyama, the capital of the Island of Shikoku. Here they lived in the luxury of a small Japanese hotel, being truly waited upon hand and foot. The duty of one small girl was simply to turn their slippers, discarded at the bedroom door, in a direction suitable for stepping into when moving off again on leaving the room. Each morning was spent in the hot sulphur bath, where fellow bathers carried out their daily ablutions around the edges of the tank which fell away so that the soapy water drained clear of the bath and a fresh pannikin was taken from the bath itself, and wherein a number of patrons were wallowing in the well-nigh boiling water, constantly added to from a pipe jutting from the side of the bath. Rest rooms were provided in the vicinity of the baths where the bather could relax in a kimono, sipping the small cups of tea and watching the coming and going in the busy little shopping street which ran beneath the windows.

Their evenings were enlivened by the company of geishas, summoned as a matter of course from the local geisha house by the hotel manager. The geisha's duty is to look attractive, tell stories, play parlour games and assist her temporary employer to raise his rice and sake to his mouth. How well established is the comfort of the male in Japan! It would be pleasant indeed if, benighted at the Railway Hotel in one of Britain's drearier Midland towns, the traveller could summon a decorative companion and pay her some trifling sum per hour to amuse him while he took his high tea in the Commercial Room.

The Emperor has a private bath at Dogo and this empty tank the visitors were shown with considerable reverence by a toothless old man who was in charge of it, guarding it and cleaning it in readiness for the infrequent visits of his Emperor.

One day Tom took a party with him to Hiroshima, where, from the roof garden of a seven-storied departmental store which had surprisingly survived the blast of the atomic bomb, they looked down upon the dwarf city which had sprung up over the whole area so recently laid waste. At the supposed centre of the devastated area, a few small stalls existed for the sale of photographs of the scenes of horror and the human wreckage which the bomb had left behind. There were also more material relics on sale, such as bricks and roof tiles, which showed signs of scorching from the heat of the blast. Tom was surprised when the Captain declined to buy one of these to add to his souvenirs, while he himself bought two tiles, the glazing of which was blackened and had air bubbles beneath its surface. At sea again, Tom came to the cuddy with a tile saying that he still thought the Captain should have one and he had bought this one for him; he knew that the Captain would regret for ever having failed to get one in Hiroshima. This tile survived the buffetings of the remainder of the voyage in the Captain's cabin, but although it had come intact through the holocaust, it was fractured into a dozen pieces with ease by his three-year-old son a few days after it had been set upon a shelf at home.

From Japan the ship sailed southwards into the warmer weather, encountering upon her way a most rugged sea-bed topography, with mountain ranges interspersed with extensive plains. The sounding and the seismic work went forward steadily with the better weather. Hour after hour the deep sounder was running, the 'ping' of the outgoing signal ringing and reverberating from the loudspeaker on the bridge. There were few places on deck where this could not be heard and the metallic and regular sound formed a background to every shipboard activity. The echo returning from the greater depths had to be listened for by the Officer on Watch, for such a signal was often too weak to record a mark upon the echo sounding paper. It was absorbing to listen for the little click which represented the return of the robust signal sent to the depths, and to note how its time taken to return lengthened or became shorter as the valleys and mountains of the ocean floor fell away or rose up beneath the ship as she steamed southward towards the Equator.

A brief pause at Manus off the coast of New Guinea was made to take in fuel from the Royal Australian Naval Base; then onwards again and southward past New Caledonia to Auckland in New Zealand where the ship was taken in hand for refit, for half of her world voyage was now over and she had encountered weeks of rugged weather.

Challenger was in New Zealand for seven weeks. It is, above all else, a hospitable country and invitations were showered upon the officers and men to stay on farms and sheep stations. Nearly the whole company went for such country holidays and all made friends. Two of the men even got married within the short spell of time available. The author was invited to Te Aute Station in the prosperous sheep-farming district of Hawke's Bay in the North Island. This station is owned by an old New Zealand family whose great-grandfather was an officer in the Royal Navy, forsaking the life to become one of the first Christian missionaries to settle in New Zealand. His son, also a missionary, was bidden by the Maoris of Hawke's Bay to travel from Otaki on the West Coast on foot and by canoe through the precipitous gorge and turbulent waters of the Manawatu River to bring his religious teaching to them. In Hawke's Bay, 100 years ago, he founded a school which became the famous Maori College of Te Aute, where many great leaders have been educated.

It was now springtime, and all was green, except the golden willows, delicate and beautiful, by the creeks. The lines of macrocarpa trees forming the windbreaks showed dark against the lush and vivid grass of the paddocks and the rounded, rumpled hills beyond.

The whole country was uniformly dotted with sheep and their lambs, and across every acre, twice each day, rode the shepherds on their rough, unshod horses to see that all was well with new-born lambs and mothers. Their teams of dogs followed the riders, alert for a command to head or drive the sheep.

With one of these shepherds rode the author, a sailor on horseback, his ship forgotten. Sailing the sea seemed a dull business when compared with these happy spring days on the sunny hills. For the first time during the voyage the ship seemed unimportant, the return to sea a dreaded undertaking. But the stocky Maori tractor driver, the Maori boys fishing for eels in the creek, the carved village meeting houses and the students at the college, all were reminiscent of the Pacific, calling one back. Slowly the mood of discontent passed—there was yet so much to be seen in that great ocean.

The author was asked to talk to the college boys about charting the seas. The Headmaster welcomed him with the news that he had been a prisoner of war in Germany with Buck Baker, and thus knew something of naval surveyors. During the lecture the author nearly committed a *faux pas*, but checked himself just in time. He had been about to refer to the discovery of New Zealand by Captain Cook when he became aware of the dusky faces of those whose ancestors had reached the Land of the Long White Cloud some hundreds of years before Captain Cook set sail.

The real discoverers were depicted on the red-ochre pillars of the school hall where the boys were gathered; curvilinear carvings showed them with lolling tongues, three-fingered hands and flashing eyes of pawa shell. These forebears had sailed on a great oceanic expedition long before Columbus was born.

The half-way break was soon over and the ship was at sea again investigating the shoals on the western side of the Kermadec Trench and the depths of the great trench itself.

The waters about New Zealand are a delight to the watcher of ocean birds from the Northern Hemisphere, for he encounters a new world of birds. The ship was usually attended by at least half-a-dozen Wandering Albatross in their various plumages, ranging from the scruffy brown youngster, through the brown and white spotted 'leopard stage' to the magnificent old birds almost white from wing-tip to wing-tip. There is also, in fewer numbers, the smaller dapper Black-browed Albatross and the black and brown Giant Petrel who tries, without success, to emulate the soaring albatross; but where they have grace the petrel is ungainly, its wings being short and broad rather than long and tapering. Other types of petrels abound, the most striking being the Cape Pigeon with its wings spotted white on black, like a domino, and the small Cook Petrel which reveals in its cartwheeling flight an under-wing surface of startling whiteness edged with black.

As the ship journeyed northwards the birds became fewer until quite suddenly one morning, in latitude about 25 degrees south, *Challenger*'s men realised that they had seen their last Wandering

Albatross and not a bird moved in an empty sky. Later that day a white flash against the distant blue above proclaimed the flight of the first Tropic Bird and the ship passed into a new avian world; the world of the Boatswain Bird, as sailors call the Tropic Bird, of the Booby which crashes clumsily onboard at nights, and the stately Frigate Bird which sails slowly above the atolls waiting for the Boobies to return from fishing, when he will swoop from above towards them, instilling such fear into these stupid birds that they cast up their food to be caught in mid-air by the attacker.

As they sailed in through the coral reefs which form the harbour of Suva, in Fiji, this was for nearly all of the company their first visit to the Islands of the South Pacific. The ship berthed on the King's Wharf and they smelt for the first time the rich sweet copra which had been unloaded from the schooners and lay in untidy heaps or in sacks alongside. The schooners themselves were loading mixed cargoes and in their rigging were small blackboards upon which were chalked the times at which each vessel would depart for their romantic sounding destinations—Rotuma, Katafanga, Levuka, Taveuni, Lakemba. The author has returned again to the Suva wharf since those days to watch the schooners loading, and has longed to stow away onboard. Despite the obvious lack of facilities for either hiding below or for modest comfort on deck, the destinations remain as romantic as ever.

Challenger's arrival in Suva coincided with the festivities being arranged by the Fijians to honour the Governor on his departure from the Islands. These included the formal and colourful kava ceremony and dances by large parties of men and women known loosely as a 'meke'. Such ceremonies may pall after many years of life in the Islands, but to see them for the first time is a thrill indeed. The leisured skill with which the group seated around the kava bowl make the precious mixture from the roots of the yanggona shrub, the drawing and the re-drawing of the hibiscus fibre through the kava to extract pieces of solid matter, the rustle of the leaves which form the green and brown skirts of the men, the hollow rhythmic clap and the grunt which issue from the seated elders to denote satisfaction with the words of their upstanding spokesman, all these are but the preliminaries to the reverent serving of the kava. Before the mixing of the kava was started, a grass rope encrusted with cowrie shells was led from the bowl itself to the feet of the Guest of Honour, who was served first. The other guests, seated within a green arbour, were served next. The Captain was among these and watched the inscrutable faces of seasoned kava drinkers for any indication of the taste he might expect, pleasant or ill. The 'bilo', or cup, in which the 'yanggona' is served is made from the lower half of a coconut shell, highly polished; it is smooth to the touch. Soon the Captain was draining the brown coloured liquid. Its taste is hard to define; unattractive at first to the European palate, it soon grows on one, for it leaves a sharp clean taste in the mouth. It is drunk by Europeans and Fijians alike in the mid-morning in many of the offices in Suva.

As the Captain came off the ship next day onto the wharf an old Fijian in khaki shorts offered him kava. Feeling that he was now a hardened kava drinker he readily consented to enter the temporary shelter where, he found, this old man made kava for the workers upon the wharf. Instead of the smooth, well-worn kava bowl made from a solid tree trunk, the old man's mixture was swilling in the rusty interior of a battered half kerosene tin. A brown chipped plastic bowl floated upon its surface, and soon this was in the Captain's hands. Fijians are nature's gentlemen, so he had been told, and thus there was now no turning back unless he risked giving offence. Luckily yanggona should be drunk at a single draught and soon the Captain was throwing back the empty little bowl and clapping his appreciation. But his friend did not end his generosity here, for every time the Captain left the ship after this, whether dressed in plain clothes or in full white Number 10 uniform with sword, and to the shrill of boatswain's calls, to call upon His Excellency, nature's own gentleman tottered out with his rusty offering of kava, and the crew paused on deck to watch the skipper in his embarrassment.

But if the formal dancing of 'mekes' on the green turf of Fiji was thrilling, the impromptu dancing at Rotuma was the real thing—the South Sea Island dancing one has dreamt about for years. The anchorage off the village at Rotuma is exposed, and so after landing the stores, which had been carried from Fiji, the ship weighed anchor and steamed to the bay known as Foviung Emua at the eastern end of the island. There the boats were lowered and, after dark, on a night of perfect calm and of white moonlight, the keels grated gently on the coral shore and a party landed to find two trucks waiting in the dark shadows of the palms to take them along the rough road which wound between low lava-stone walls to the village. Doctor Evans, the Administrator, was the only European living on the island and with him the Captain and members of the crew sat down beneath a palm-leaf canopy that had been rapidly constructed in front of the general store. The orchestra consisted of men seated around a pile of rolled grass mats upon which they beat a vigorous rhythm with their short sticks. The dancers were arranged in a rectangle, 42 of them in rows of six, three men and three women in each row. As the dances progressed without pause the front row would from time to time turn and go to form the rear rank and the second row of dancers moved forward into the limelight. The whole dancing team sang continuously. Clad in bright red and white lava-lavas, wearing the traditional grass skirts, with wreaths of green interspersed with white flowers and the crushed red fruits of the pandanus tree in their hair, the dancers made an active and all absorbing scene. They went on and on; the rhythm changed from slow to fast; men and women now began to come forward singly or in pairs to perform some particular variation of their own, hips swinging, arms moving, knees bending with acrobatic agility. Sweat poured from foreheads and formed in beads upon bronze chests, but still the ranks kept coming forward as the music, now enlivened with an electric guitar, became more and more insistent. The ship, the sea, the distant homecoming, all were forgotten by the sailors as they watched, utterly absorbed, wishing this Rotuman night to go on for ever.

At last the music stopped, as abruptly as it had started three hours before. The singing ceased and the dancers sank where they were to the ground. A moment's complete silence reigned and then Dr. Evans leant over to the Captain and whispered that a few words were now expected of him. He rose, and speaking slowly through the Government Clerk, who interpreted, he thanked the people of Rotuma for this glorious evening. Never had he seen dancing to equal it nor a setting so lovely, for the moon was now above the mountainous little island that lay in the sea but half a mile from the village. These utterings, as they were interpreted, were hailed with appreciative mumblings from the exhausted dancers and the Rotumans who were sitting round them. Then an elderly male dancer spoke to the interpreter, who turned to the Captain. 'They ask if you have talcum powder with you,' he said. The Captain looked baffled, and the interpreter explained that to sprinkle such scented powder upon the dancers at this stage would have been the highest praise the ship could have showered upon them. The surprised Captain recovered himself and said that next time he sailed to Rotuma he would bring a cargo of such powder from Fiji instead of the Public Works Department water tanks that he had brought on this occasion. This caused a roar of applause and the speeches were over.

Hours later the sailors reached the coral beach to embark again. The sleepy boat's crew who had been waiting on the shore were surprised to see their messmates, grass skirts about their waists and leis about their necks, being farewelled by the girls of Rotuma as if they had been Rotumans themselves going out on a journey to the world beyond the reef.

XVII

Atolls

Funafuti in the Ellice Islands is a classic coral atoll; shaped like a gigantic pear, the lagoon is 13 miles long in the north and south direction and 9 miles from east to west. The lagoon is about 25 fathoms deep and is surrounded by a thin line of reef which is broken here and there, mostly upon the leeward or western side; such channels permit vessels to navigate from the deep ocean outside to a safe and secure anchorage within. Time and the battering of the waves on the reefs have thrown sufficient coral debris above sea level for floating coconuts and other seeds to have established themselves as trees and bushes from which organic matter has in turn fallen to form soil upon which Man, travelling south-eastward into the Pacific some 2000 years ago, was able to settle, being guided by land birds such as the Golden Plover on their migrations through Micronesia.

There is one village on Funafuti, and that lies on the main island of Fongafale, which is about seven miles long but only about 500 yards across at its widest part from the lagoon to the white breakers pounding the eastern shore. It is here that the village is situated; the cooking huts along the shore of the lagoon, and the houses, widely spaced, among the tall coconut palms behind them.

Challenger spent the night anchored precariously on a shallow spit outside the lagoon, for it was inadvisable to navigate the narrow channels through the reefs until the sun was well up in the sky and illuminating the amber-coloured coral flats and the pale green of the shallows between which the ship had to pass in the deep blue water, turning this way and that as the channel twisted its way into the safety of the lagoon. Once inside the atoll the run across to the village was simple enough, and even before the slip was knocked from the cable a little party were seen in their boat well on their way off from the village to board the ship.

It is always an exciting moment for the sailor when he makes his first contact with people he has not visited before. The boat brought Chief Clerk Kofe, the Assistant Medical Practitioner and the island's only policeman. There were no Europeans in the Ellice Islands at this time and the Gilbertese District Officer was far away on the other side of the world studying at Oxford. But the local Native Magistrate, assisted by Kofe, was doing a fine job of quiet, efficient administration. The Chief Clerk was now making his official call in true Colonial tradition, neatly attired in his white duck suit.

Whilst Kofe and the A.M.P. took tea with the Captain and spoke of the activities in their little-visited territory, the policeman on deck was subjected to many interested questions, for all three men spoke English. The Supply Officer was interested to know whether there was much crime in such an isolated community of 350 souls, and asked the policeman if there were any prisoners in gaol. 'Yes, we have one man in prison,' he replied. 'What for?' asked the Paymaster, to which the policeman replied in one word, common enough in a sailor's vocabulary but not looked upon as a crime in itself in the western world.

This was by no means the first visit to Funafuti of a ship carrying enquiring scientists, for between 1896 and 1900 a series of expeditions had reached this atoll under the auspices of the Royal Society's Coral Reef Committee; at first they had come in the naval surveying ship *Penguin* and later in a number of other craft to make deep borings below the islands around the lagoon. Darwin's theory of atoll construction was being challenged at this time. He believed that the atolls had begun their life as fringing reefs about the coast of high islands, which having been raised up by volcanic action from the deep ocean floor had for millions of years been sinking slowly back into the earth's crust. As the highest peaks had at last sunk beneath sea level there remained a void at the centre of the reef where food for the polyp was scarce and which became a lagoon floored with coral debris. Murray, who had been on the earlier *Challenger* expedition, suggested that the atolls were formed by coral growing upon clay-like sediments covering submerged seamounts, which lay at a depth less than 200 feet below the sea surface, enabling the shallow reef-building corals to grow; for at greater depths these polyps cannot remain alive, and in Darwin's theory they are presumed to continue growing upwards on a platform of dead and dying coral.

The Coral Reef Committee during their various visits to Funafuti made a series of borings, the most successful of which had reached a depth of 1114 feet on the main island, not far from the village. Borings to any great depth within the lagoon itself had proved technically too difficult.

Analysis of the cores obtained from these borings showed coral rock of a shallow water type to their greatest depths. At first this seemed to support Darwin's theory, for if Murray was correct, rock other than limestone would have been encountered at comparatively shallow depths. The borings were, however, near the seaward edge of the whole atoll structure, and followers of the new theory claimed that such borings were almost entirely through the talus or slope of coral debris which was being constantly broken from the edge of the reef by the unceasing pounding of the breakers. Such material would certainly fall down the steep slopes towards the ocean floor and would form a sort of coral rubbish dump to great depths.

What was needed to clinch either theory was a boring in the centre of the lagoon, a wildly expensive and technically difficult task. However, the seismic apparatus in *Challenger* was well suited for this work, for it had been used successfully to measure the thickness of the sediment layers upon the floor of the ocean and could be used similarly in the lagoon at Funafuti to measure the thickness of the coral limestone, overlying something harder.

The technique was similar to that which the ship had used at sea, but within the lagoon she lay at anchor using her photographic device to record the times of the returning sound signals from the floor of the lagoon initiated by the firing of charges from the ship's boats at varying distances from the anchored ship. These returning signals were picked up by the sono-buoy hydrophones, the buoys themselves being anchored on a line between the ship and the far-away boat.

The Captain went ashore to see the village and to tell the people of Funafuti what was happening. An old man remembered the coming of the scientists of the Coral Investigation Committee 50 years before, and he led Dr. Gaskell to the site of the deep borehole, the mouth of the hole being still visible but choked with vegetation. Apart from the Native Magistrate, who was absent from the island, there were two other important personalties to call upon—the Pastor, and the keeper of the Government Store, Mr. Reher, who sold cloth and bicycles and other commodities whenever they became available to him on the occasional visits of the government store-carrying ship. The Pastor was away working upon his taro patch, it was said, but the visitors must sit down while he was sent for; and while they waited, the Pastor's daughters gave them green coconuts, their tops neatly cut off like an egg at the breakfast table, so that they might drink the refreshing, cold liquid which such immature nuts contain. Like many London Mission Society pastors, he was a Samoan, massive of build and cheerful of nature. He invited the Challengers to his church the following Sunday, a service that everyone on the island attended and where the singing was vigorous. The church at Funafuti has two floors, the main part of the chapel being upstairs. Women with very small children stay below, but the remainder of the little ones sit at the front of the congregation, girls on one side and boys upon the other. There they are under the eyes of two elderly sidesmen who, from time to time throughout the service, walk among them to distribute a hearty barefooted kick to those who are misbehaving.

The Pastor had a blind brother who played the harmonium in church and was also led to the meeting house in the evenings during *Challenger*'s visit so that he might play for the hulas which were danced in the intervals between the Ellice Island dances. The women and girls invited the sailors to hula with them, much of this dance here being done in a crouching position known in physical training parlance as 'full knees bend', and somewhat painful to untrained Europeans. A hissing noise between the teeth is emitted by both dancers from time to time.

The local dances are acted by a line of seven or eight performers, male and female, and consist of numerous actions which become more vigorous as the dance gathers momentum, accompanied by the rhythmic banging of sticks upon upturned boxes. Eventually the dancers are exhausted and they sink to the mat-strewn floor for a brief respite before the singing and the insistent thumping starts again and the dancers rise once more. The author asked an elder what the actions in these dances represented, imagining that the actors were re-living great battles or canoe voyages in their distant past. The elder replied, however, without much conviction, that they were Bible stories, but failed to put a satisfactory name to any one of these.

On the last night in the meeting-house at Funafuti, when all were utterly exhausted after taking part in the many action dances, the island girls began to lay a great quantity of shell ornaments, necklaces, belts and hat bands as well as hats and fans at the Captain's feet, where he sat with one or two of the Kaubures, or members of the Island Council; it seemed that the presentation would never end as more and more girls appeared and re-appeared loaded with gifts. There were enough of these articles for every one of the ship's company to carry away some memento of the glorious days and nights they had spent at Funafuti among its charming and happy people.

There was time for much sport as well as science. A cricket match, an outrigger canoe race and a sailing race were all contested between the islanders and the sailors. The sailing boats at Funafuti are of European design, doubtless introduced into the island by some long-forgotten District Officer. There are about fifteen of these boats now, all built on Funafuti, and as well as taking a dozen or so of a crew they carry a great deal of canvas. On the British Sovereign's Birthday and on Boxing Day, a sailing race is always held on the spacious waters of the lagoon. Such a race was now arranged, *Challenger*'s own surf boat taking part. These races are started in a novel manner. The prevailing wind blows in over the village from the east and across the lagoon; the boats, fully loaded, with whole families forming enthusiastic sailing crews, are lined up off the village beach; the sails are fully rigged and filled with the wind while one member of the crew, knee-deep in the water, holds the boat's stern. At the word 'go' each thrusts off his boat and leaps in and the whole fleet is quickly running before the wind in a spectacular and even start.

While the scientists and their naval assistants became daily more sun-tanned during their long days exploding charges from the

FIJIAN WOMEN
DANCE THE
'MEKE'

CHILDREN ON
FUNAFUTI ATOLL

boat, the Medical Officer and the author went away in the small motor skiff to collect living shells and seaweeds around the perimeter reefs of the atoll. Such collections had been requested by the Museum and the University in Auckland and proved a fascinating occupation. Different islands around the atoll had to be visited each day so that the different molluscae and algae might be sampled, both inside and outside the lagoon, to windward and to leeward of the reef, for each had a different environment and each would have its different communities.

To cross the lagoon on these expeditions might take two hours and the small, palm-clad islet for which the party were bound would be below the horizon for many miles of the voyage. It sometimes appeared to the Medical Officer, Leading Sick Berth Attendant Soulsby who accompanied them, and the author, that the three of them were bound westward into the open Pacific in their small, inadequate craft; but slowly the palms on their objective would creep up over the horizon, and an hour or so later they anchored off the reef and waded through the shallows to the glaring white coral beach beneath the towering trees in which beautiful White Terns fluttered like pigeons or sat regarding the intruders with one small black-ringed eye. Landing thus on the first occasion Soulsby was reminded by the familiarity of the scene, tall trees fringing the shore, of an earlier incident in the commission and to the party's amusement began to chant the once familar call 'Hope, Abel!'

The collectors then split up and walked the reefs, finding frequent treasures. Shells there were of many types, and small coraline seaweeds of brilliant green and red hues. Gradually, the saltwater and formalin containing jars onboard became full of specimens. At Fongafale the assistance of the children was obtained, for they knew where to find the shells, which they required for the making of necklaces and hatbands. The author went with Reher, the storekeeper, on an expedition along the shore in search of living cowries. They had chosen a time of low water at dark midnight and Reher flashed a torch beneath the large overhanging coral boulders for he knew where the cowries would be, clinging like great slugs to the underside of the rocks. He guided the author on as they filled the specimen bottles, his gentle voice barely audible above the sound of the breakers on the seaward side of the island a few hundred yards away.

Although *Challenger* was at Funafuti only about a fortnight her men became a part of the place; they spent their evenings in the scattered, palm-thatched homes along the 'main street', while Tom and the Captain, at the invitation of Chief Clerk Kofe, occupied the empty District Officer's house for a night or two and imagined themselves administering these lovely atolls. It was a sad moment when the ship's boat left the wharf for the last time, carefully navigating through the children splashing in the water and leaping from the jetty into the sea ahead of her. Reher's big straw hat and the massive figure of the Pastor could be seen above the group that stood watching on the wharf till the ship had weighed and turned to the westward.

The Ellice group is formed of nine islands, the local name for them, 'Tavalu', denoting this number. Nukufetau was the next of the group visited, 60 miles to the north, and it appeared over the horizon at first like the two masts of a ship, which resolved themselves into towering trees as the island gradually took shape. As at Funafuti, the ship was able to anchor within the lagoon, which is enclosed by an almost perfect rectangle of reefs and low islands, with the village situated at the south-west corner.

A ship had been lost on the northern part of this atoll some months previously and it was the surveyor's task to fix the island by star sights ashore, using the theodolite, as the wreck enquiry had thrown some doubt as to the exact position of Nukufetau. The scientists were delighted to visit another atoll similar in construction to Funafuti, and they were soon at work with their charges verifying the doubtful points which still remained after their work at Funafuti.

Here there was no convenient wharf and, except at high tide, those landing had to disembark from the ship's boats at the edge of the reef and either wade or be pushed in a narrow and shallow draught canoe across the half-mile of shallows to the village. A tried and trusted surveying recorder was landed to find a suitable location for the taking of the sights and to find accommodation for the party who would be observing throughout the night, and therefore must live ashore. When the Captain landed next day everything was in perfect order. The brass plate marking the observation spot had already been cemented into position in the open space before the court house, while camp beds and mosquito nets had been set up within; the chronometer which was to play such a vital part in the sight-taking was ticking away snugly in its case alongside the radio to be used for the time signals, and which was now playing Hawaiian music to the delight of the considerable crowd that had taken up its position around the entrance to the palm-thatched court house to await developments. Staff had been taken on and consisted of massive, bronze Toma, who was busy in a nearby cooking hut preparing a meal of roast chicken and taros for the party, and a girl of extremely comely appearance, with a flowered garland in her hair, who was sweeping the bare ground around the observation spot with a sort of hand besom made of the mid-ribs of coconut leaves. A small group of chickens lay tethered in preparation for the following meal and a sucking pig secured by one hind leg was close-by. Almost at once on the arrival of the surveying party some of the crowd began an impromptu dance while the remainder made way for them, and soon the dancers were screaming with delight as the Captain walked among them scattering talcum powder, for on this occasion he had come prepared.

Shortly after sunset on the second night ashore it became necessary to signal off to the ship to send a battery in by boat, and the shore party set out wading to the edge of the reef to meet it. There was a strong north-easterly breeze blowing straight from the ship towards the village, and as they felt their way in the darkness of the cloudy night the waders could see the lights of the motor skiff appearing and disappearing as she rose and fell on the waves on her way inshore. The waders were unaware however that a fleet of unlit sailing canoes was bearing down upon them, speeding on their way before the wind towards the village. As they neared the breakers at the reef's edge they saw first one and then another of the canoes, and there they stood, now waist deep in the water, shouting to make their presence known as the canoes swept past on either side. As they came in over the shallows many of the male members of the crews leapt out to lighten their craft that they might continue onwards towards the village. It was a tense moment as the canoes came in, for those sailing them did not notice the waders in the general excitement of coming through the breakers, and it was lucky that they were not mown down. The greater part of the island's population had spent the afternoon onboard buying, at the ship's canteen, chocolates, tinned fruit, cigarettes and, of course, talcum powder, of which there now remained no tins whatsoever.

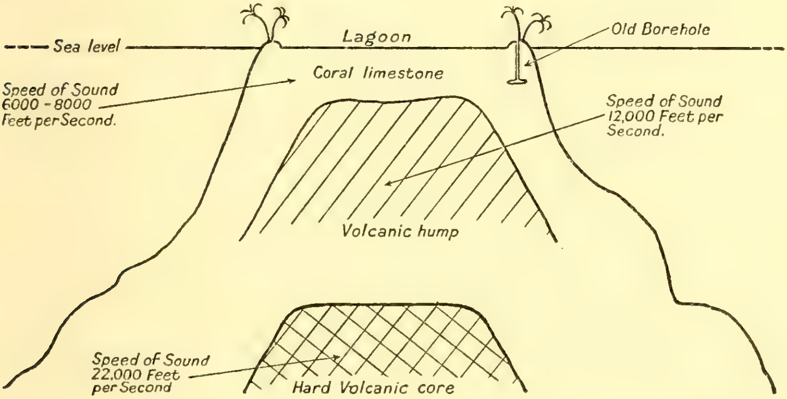
The inevitable dance took place in the meeting house on the last night ashore, a party of youngsters being employed throughout the evening alternately erecting the thatch screens on the windward side of the building, for it was a wild night, and taking them down again as the dancers called for air after their labours.

When the campers returned to the court house in the early hours the surveying recorder was absent, but by morning he was with them again. It was many months afterwards before the events of this night reached the Captain's ears. As the Paymaster had been told, sleeping with someone other than one's husband or wife is a punishable offence in the Ellice group, and the attractive girl who had been laid on to sweep the court house was in fact such a prisoner doing her daily prison tasks. The missing man had fallen for the girl and had asked the jailer if he might release her from prison on the night of the dance. This he had absolutely refused to do, fearing retribution from the Kaubures; however, he saw no harm in locking the sailor up inside the prison with the prisoner for the night, releasing him again as dawn crept over the island.

The scientists had finished their work in the lagoon, the surveyors were content with their sights, farewells were said once again, a frequent and oft-recurring duty on this voyage, and the ship sailed out and away for Manus in the Admiralty Islands, 2000 miles to the westward.

Tom Gaskell and John Swallow turned to their mass of seismic records—long, narrow sheets of paper with long steady lines, here and there violently interrupted, showing the vital time of returning sound waves from the floor of the lagoon. There was much drawing of graphs in the chartroom, making of computations, gloom as pieces of scientific evidence failed to fit in, excitement and renewed efforts when the data began to dove-tail like pieces of a jig-saw to form the picture of the atoll structure.

Doctor Gaskell has described this work in scientific papers and has voiced his propositions at learned symposiums with a wealth of detail which baffles the layman, but a few weeks after the visit to the Ellice Islands he gave the Challengers, in an article in the ship's magazine, a simple account of the results of these experiments. At Funafuti, he said, they had found a depth of 1800 feet of rock in which the velocity of sound was 6000–8000 feet per second, such a velocity being much as one would expect in coral limestone. Below this lay material with a velocity of sound of 12,000 feet per second, which could either be hard limestone or volcanic rock. To clear up the matter he had carried the explosions in Nukufetau right up to the edge of the reef and these showed that the border between these two layers fell rapidly away as the perimeter was reached, which gave a picture of a supposed volcanic hump within the heart of the atoll structure. Deeper again an even harder material was located, probably the true volcanic core of the original volcano which had formed the island.


Sea level
Lagoon
Old Borehole
Coral limestone
Speed of Sound 6000 - 8000 Feet per Second.
Speed of Sound 12,000 Feet per Second.
Volcanic hump
Speed of Sound 22,000 Feet per Second
Hard Volcanic core

Structure of Funafuti Atoll as deduced from seismic experiment

Thus, on the seismic evidence obtained by *Challenger* it would seem that as the coral cannot live at a depth greater than 200 feet below the surface of the ocean, the atolls forming the Ellice

Group at least, are being built up gradually upon old, sinking volcanoes as Darwin had proposed. As Gaskell and Swallow concluded that there was 2500 feet of coral below Nukufetau, a considerably greater depth than that under Funafuti, it would seem perhaps that while Funafuti still remained an island about 500 feet high, Nukufetau as a volcanic island had passed from the face of the oceans.

XVIII

The Deepest Depths

On the way south from Japan to Manus Dr. Gaskell had said that he wished to carry out one of his seismic experiments in a deep trench in order to find out something of the structure of the sea-floor in such an area. So, as the ship moved into the Marianas Trench between Guam and Ulithi, John Swallow was active with the seismic gear, using it purely as a reflection or sounding machine to record the time of the double passage of sound from the small charge he exploded until it returned as an echo from the sea-bed to his hydrophone, thus giving him the depth. The soundings rapidly increased and soon Swallow was reporting over 5000 fathoms and finally 5663 fathoms.

This was an exciting report, for it was known to be nearly as deep as any sounding so far recorded. But unfortunately it was about 1000 fathoms beyond the scope of the deep echo sounding machine at this time. But using the taut wire machine, with 140 pounds of scrap iron attached to the end of the wire, as a sounding machine, a depth of 5899 fathoms was recorded. This was a new deep record for the world.

The history of deep sounding in the ocean is not a long one. It was during Lord Mulgrave's expedition to the Arctic in 1773 that some of the earliest attempts at deep sounding were made, the greatest depth sounded being 683 fathoms, from whence a sample of sediment was obtained.

In 1817–18 Sir John Ross, during a voyage to Baffin Bay, made some deep sea soundings using a 'deep sea clamm' on the end of his rope which brought up several pounds of greenish mud from his deepest sounding of 1050 fathoms.

Sir James Clark Ross led an expedition to the Antarctic in the ships *Erebus* and *Terror* in the years 1839–43, during which time he really started systematic deep sea sounding. He had a line 3600 fathoms long made up onboard, and this he allowed to run out from a large reel fitted in one of the ship's boats. The line was marked every 100 fathoms and while the line ran out the time was noted as each mark left the reel. When the time interval between two marks appreciably lengthened the weight at the line's end was assumed to have reached the bottom and the amount of line out taken to indicate the depth.

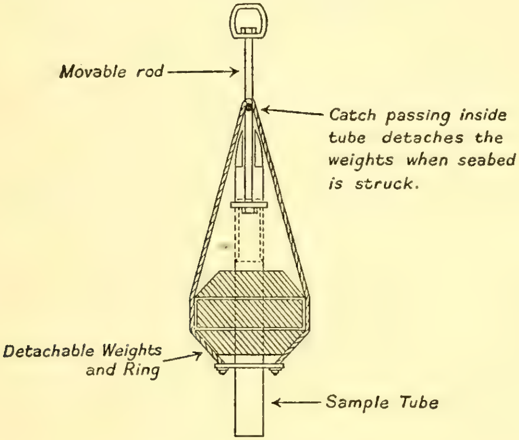
The procedure in the boat was necessarily one for calm weather and this restricted the number of successful casts made in the open sea; with this apparatus, however, the first 'abysmal' soundings, as the oceanographic text-books call them, were taken and 2425 fathoms was plumbed in the South Atlantic in 1840.

One of the early snags of deep sounding was that a heavy weight was needed to take the line down, but to recover such a weight with the bottom sample adhering to it a very bulky line was required. There was in the United States Navy at this time the now famous officer, Lieutenant Maury, who had produced numerous wind and current charts and sailing directions for mariners. Working under him was a Midshipman Brooke, who about the year 1859 constructed an apparatus which took a sample of the sea-bed and then detached the bulk of the heavy weight which had taken it down, leaving only a light tube, inside which the sample was retained, to be hauled back to the surface. This invention speeded up the sounding of the oceans and in 1854 Maury was able to make the first bathymetric chart of the North Atlantic. This apparatus, modified by Lieutenant Baillie, Royal Navy, and named after him, is still in use today.

The earlier *Challenger* Expedition is said to have carried wire for sounding purposes, but for some reason this was not used and the method of using marked rope and time intervals was employed for taking the many ocean soundings which this vessel made. Her deepest for the voyage was 4500 fathoms, recorded in the Marianas Trench where the recent *Challenger* found her deepest sounding referred to above.

The U.S.S. *Tuscarora* was also at sea employed upon oceanographic work at the time of the *Challenger* Expedition and it was from her that piano wire was first used for sounding great depths. With this wire she sounded 4655 fathoms just east of the Kuril Islands in the northern part of the Japan Trench.

The first ship to sound at a greater depth than 5000 fathoms was the British surveying vessel *Penguin* in 1895. Her Captain was Andrew Balfour, who had been a sub-lieutenant in *Challenger* during the Expedition and ever since had been fired with enthusiasm to find a great depth. He took two soundings with piano wire on a steam sounding machine which had by then come into use; these soundings were taken in the Kermadec Trench, in the South Pacific, north-east of New Zealand. On the first occasion, as so often happens, the wire parted while the Baillie rod was being hauled to the surface. As the rod is comparatively light, the parting of the wire is not readily apparent and it is only as the hours pass that the surveyors, constantly feeling the wire, begin to suspect that the worst has happened, for it takes over four hours to haul in the sampler from 5000 fathoms. It took Andrew Balfour far longer, for when he recorded a sounding of 5155 fathoms he insisted that to avoid parting the wire again, watches of two seamen at a time hove in the whole five miles of wire by using the manual handles on the machine, so that no undue strain of an unfeeling steam engine would be imparted to the thin wire as the ship rolled in the heavy swell. He never left the winch himself throughout the whole long day, and thankfully and excitedly he ladled the sediment from the sampler onto a plate he had kept beside him in readiness for this supreme moment.


Movable rod
Catch passing inside tube detaches the weights when seabed is struck.
Detachable Weights and Ring
Sample Tube

Baillie Rod and Sinkers

The German ship *Planet* shifted the scene of greatest depth once again to the northern hemisphere—in the Philippine Trench close eastward of the islands which give it the name. And here some years later the Dutch vessel *Willebord Snellius* subsequently found 5539 fathoms, using early audio-frequency sounding methods.

The U.S.S. *Ramapo* moved the scene once more to the Japan Trench with 5673 fathoms, using audio-frequency methods, but the German *Emden*, returning to the Philippine Trench, found just a few more fathoms to make it 5686.

This was the state of great depth sounding when World War II came. But at the close of the Pacific War the United States was once again to take the lead in the friendly rivalry of deep ocean discovery. Dr. H. H. Hess, a University Professor, had studied the shape of the ocean floor for many years and had produced the best bathymetric chart of the North Pacific available before the war. Like so many others of his calling, he joined the Services and his knowledge of the sea took him into the Navy, where he eventually commanded a large Fleet oiler, the U.S.S. *Cape Johnson*.

Commander Hess's crew was composed of reserves and he had no difficulty in persuading them that it was normal in the Navy to carry out standard oceanographic observations as the vessel proceeded upon her naval duties across the oceans. Thus this ship was able to add much to the knowledge of oceanography and eventually sounded with her echo sounding machine in the Philippine Trench, recording there a depth of 5740 fathoms, now known as the 'Cape Johnson Depth', from which the Danish research ship *Galathea* later dredged up forms of life including small sea anemonies, a number of worms and some living bacteria.

The scene of the greatest depth having once again shifted to the Marianas Trench, *Challenger* was determined to make a survey of the deep area and to get a sample of sediment from the depths. During the visit to New Zealand the ship enjoyed great assistance from knowledgeable technicians in the Royal New Zealand Dockyard at Devonport who managed to boost the echo sounder to record at the greatest depths; here also extra wire for the sounding machine was obtained.

It was an exciting moment as *Challenger* steamed back into the trench on the way northwards from Manus to Japan, for this time she was not restricted to spot soundings here and there; enthusiasm rose as the water became deeper and deeper, and still the officer with headphones sitting before the sounder could hear the small answering signal returning from the depths first eight, then slowly nine, ten, eleven, twelve and finally fourteen seconds after the metallic sound of the outgoing signal had been heard. For such is the time the sound takes to reach the sea-bed and return from 5900 fathoms.

Sounding lines were run at right angles to the east-west axis of the trench thus obtaining profiles across this giant crack on the surface of the globe. Such trenches do not have spectacular slopes as one might find in a canyon on land, but descend slowly and steadily to meet in a small flat expanse at the bottom of the trench from which the echo returns more loudly and clearly than from any other part. On completion of the mapping it appeared that there was a considerable area of a depth greater than 5900 fathoms and that a sounding of 5940 fathoms existed. But the 6000 fathom barrier remained inviolate.

A sample from the trench was obtained with the Baillie rod after three attempts. It is difficult when using the steam sounding machine in such depths to know just when the sampler has reached the bottom, and during the short delay between realising that the bottom has been reached and the application of the brake to stop more wire running out, a certain amount of the wire will have coiled itself upon the sea-floor beside the sampler. When the winch begins to heave, these coils become kinks, and often, perhaps hours later when the sample seems to be almost on deck, the wire finally parts at the kink and the six-hour task has to be done all over again. This difficulty was finally overcome by laying up the whole of the last 100 fathoms of piano wire within a piece of rope which obviated the kinking as the superfluous wire coiled onto the sea-bed $6\frac{3}{4}$ land miles below.

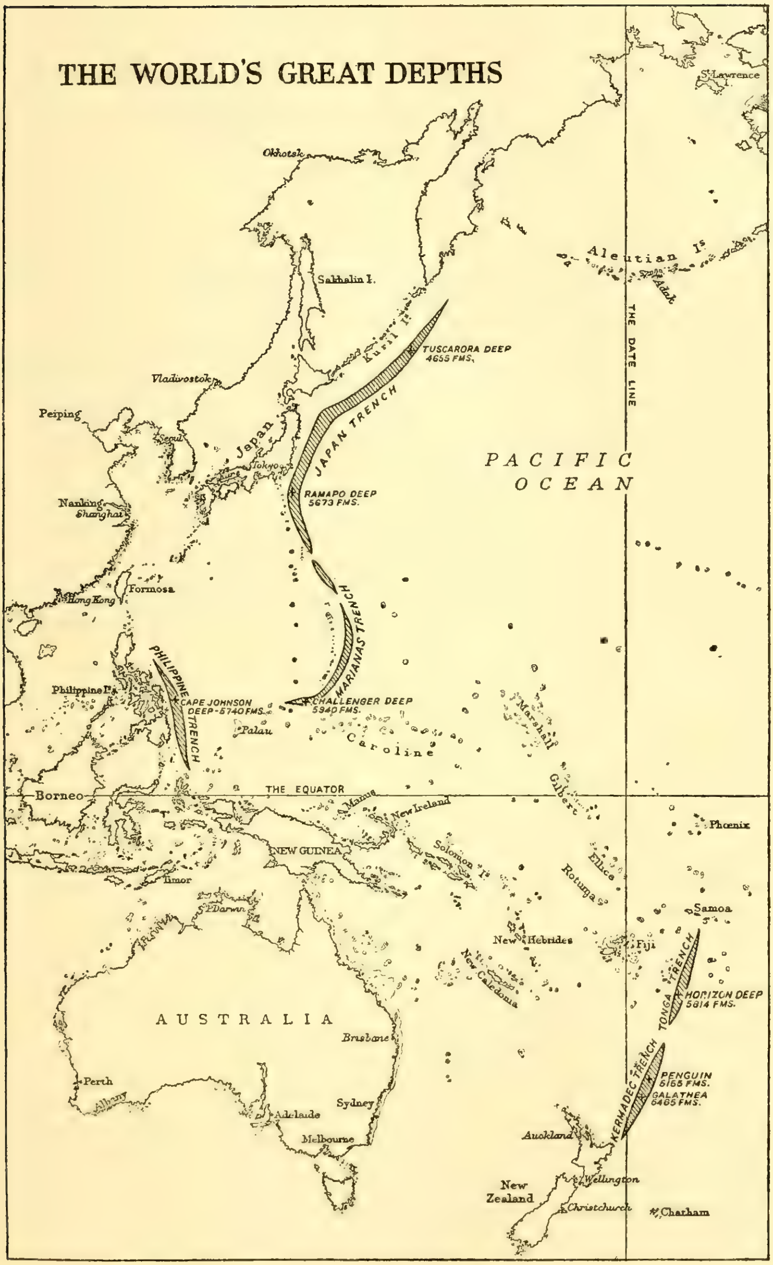
Excitement on deck was tense when, at long last, the ceaseless chugging of the winch was slowed and Petty Officer Greenshields grasped the rope and hauled in hand-over-hand. Even before the sampler could be clearly sighted a brown cloud was seen spreading from it, indicating that the rod must contain a sample of what the surveyor has termed 'red clay', the deposit of the great depths.

Very considerable areas of the ocean floor are composed of ooze formed by countless millions of calcerous skeletons of microscopic and macroscopic plankton which has lived its brief life near the sea's surface, and having died there, sunk slowly to form this deposit. At greater depths than 3000 fathoms or so the calcerous deposits are no more and only the skeletons of silicate forms of plankton remain, for the calcerous forms have been eroded away during their long slow fall and have become once again an integral part of sea water. But the silicate forms continue unscathed to the great depths, where are found the skeletons of diatoms, the plants, and radiolarians, the animals, which, with red volcanic dust which has fallen upon the sea surface miles above, form the really deep ocean deposits.

Such a sample now lay secure in a pickle jar, and this the author took home with him when he left the ship a month or so later in November, 1951. Back in London, he made his way to that ormolu building of many turrets which houses the British Museum of Natural History in the Cromwell Road. It was the first of many visits to this treasure-house, and he was taking the cherished deep bottom sample to Dr. J. D. H. Wiseman, who is an expert in such matters. To reach his lair a guide was followed who took the author at once from the main hall, where stuffed elephants stand with oversized statues of Darwin and Huxley, down to the cellars beneath. Here they passed along a maze of corridors lined with racks on which are stacked spare, and forgotten stuffed animals, their horns, their hoofs, their heads and their bones, like some nightmare Aladdin's cave. At last the guide reached a locked door upon which he rapped with a conspiratorial air, and they were admitted to Dr. Wiseman's presence.

The small pickle jar looked insignificant as it was placed upon the table among many other jars of more imposing size and content. But Dr. Wiseman's enthusiasm made up for this, and soon he and his companions were inspecting the sample through microscopes, searching for the skeletons of the planktonic animals and plants which it contained, and which had once floated near the blue surface of the far-away Pacific Ocean.

The search for greater depths still goes on and the Marianas Trench may not remain for long the deepest known part of the


THE WORLD'S GREAT DEPTHS
Okhotsk
St. Lawrence I.
Aleutian Is
Adak
Sakhalin I.
Kuril Is
TUSCARORA DEEP 4655 FMS.
THE DATE LINE
Vladivostok
JAPAN TRENCH
Peiping
Seoul
Japan
Tokyo
PACIFIC OCEAN
RAMAPO DEEP 5673 FMS.
Nanking
Shanghai
Formosa
Hong Kong
MARIANAS TRENCH
PHILIPPINE TRENCH
Philippine Is
CAPE JOHNSON DEEP - 5740 FMS.
CHALLENGER DEEP 5940 FMS.
Palau
Caroline
Marshall
Gilbert
Borneo
THE EQUATOR
Manus
New Ireland
Phoenix
NEW GUINEA
Solomon Is
Ellice
Rotuma
Timor
Darwin
Samoa
New Hebrides
Fiji
New Caledonia
TONGA TRENCH
HORIZON DEEP 5814 FMS.
AUSTRALIA
Brisbane
Perth
Albany
KERMADEC TRENCH
PENGUIN 5155 FMS.
GALATHEA 5465 FMS.
Sydney
Adelaide
Auckland
Melbourne
New Zealand
Wellington
Christchurch
Chatham

The Western Pacific, showing positions of the main ocean trenches globe. Even as this is being written there comes a report from the Scripps Institution of Oceanography in California that their research vessel *Horizon* has sounded in 5814 fathoms in the Tonga Trench, where she has carried out a considerable survey. A study of their sounding records leads them to believe that depths of at least 5900 fathoms probably exist here.*

Ever since Andrew Balfour brought up his cherished bottom sample from the depths of the Kermadec Trench in 1895, the deep places in the oceans which have subsequently been discovered have exceeded in depth the height of Mount Everest.

Nor are those who will one day actually visit these deeps so far behind the discoverers, for Professor Auguste Piccard recently dived in his bathyscaphe to 1722 fathoms in the Mediterranean. This record was later broken by the two French Naval Officers, Lieutenant-Commander Nicolas Houot and Engineer Henri Willm, who descended in their submarine-shaped craft to 2215 fathoms off Dakar. They were confident that their bathyscaphe would have withstood much greater pressures; so that in the not too distant future Man may actually visit the great Pacific depths in the Philippines, Japan, Marianas and Kermadec and Tonga Trenches.

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* In July, 1956, it was reported that H.M. Submarine *Telemachus* had, whilst on a gravity survey and carrying American and Australian scientists, sounded with sonic methods to a depth of 5675 fathoms in the Tonga Trench. Her Commanding Officer was Lieutenant-Commander J. E. Moore who had had the battle with wild bees on the water tower at Mombasa in 1942.

XIX

Homeward

BACK in Kure, Bill Ashton became the last one of those many who returned for a second commission in the *Challenger*, this time as her last Commanding Officer. Almost at once he took the ship to Ominato, at the northern end of the main Japanese island of Honshu. This was not the Japan of green valleys and blossoming cherry trees, for it was winter time and Ominato lay deep under snow. It was a town of slushy streets, whose inhabitants in padded coats and fur-lined caps hurried home to their charcoal stoves and sukiyaki.

Ominato had formerly been a minor Japanese naval base and at this time there was a proposal, since dropped, that the British Fleet might visit there in the heat of Hong-Kong's summer, much as they had visited Wei-Hai-Wei before the War.

There was an interpreter here called Hamaya who assisted the ship and introduced the various local figures. As the weeks passed the ship became a part of the local landscape moored at her buoy in the harbour while the boats were away on the survey, and her men had many acquaintances in the township with whom they drank sake, ate sashmi (raw fish) or learnt judo.

Tom explored the barren hinterland on skis, worn, as the locals wore theirs, by pushing his feet into rubber boots which were roughly secured with string to the skis.

During the visit the Wardroom were invited to Hamaya's wedding. Some discussion took place onboard as to what would constitute a good wedding present. It was finally decided to give him and his bride a ship's crest painted on a shield, an item of which Number One kept a large stock for all manner of gift-giving occasions, a bottle of Scotch and a few odds and ends from the canteen. Having checked their stockings for holes they landed and made their way to the house where the wedding was to be celebrated and where they found that the normal wedding gifts were beautifully decorated envelopes containing money heaped upon a plate before a small shrine together with symbols representing the various aspects of marriage. Rice cake to indicate the domestic work which the wife would have to do; two fish for the husband's task as family provider; a painted scroll with cranes and tortoises for patience and long life; a bowl of fruit for fertility, two ceremonial sake flasks and two minute cups with which to seal the marriage. Magnum-sized bottles of sake formed the background of this display.

The bride's dress is traditional and is often hired for the occasion in these days. It consists of a black kimono and red obei which is passed many times around the waist and finally made up around a former or core at the back somewhat like a knapsack. The back of the bride's neck had been shaved and she wore a gigantic wig of black hair set above the head in the traditional Japanese style. Her face and neck had been liberally powdered, only her faintly orange cheeks and scarlet mouth relieving the whitewashed appearance. A silver-coloured shade with pendants dangling from it hid her eyes from view.

The 'matchmaker' is an important personage at a Japanese wedding, being the go-between for the groom and the bride up till the time of their marriage. Although the guests wore Japanese dress, the matchmaker wore tails.

An old member of the bridegroom's family performed the wedding ceremony, after which both bride and groom had to drink nine cups of sake handed to them. The circulation of sake then became general and relations and guests were each handed the small cups which were drained in three noisy gulps. Then each in turn had to offer a cup of sake to the groom with the word 'dozo', well known to those who have visited Japan, for it means 'Cheers' or something rather more forceful, urging one's companion to drink also. Then dozoing too became general, everyone toasting everyone else in a flurry of sake drinking from the thimble-sized cups.

While this was going on, others were preparing beautiful-looking food on brightly coloured trays, for to the Japanese the appearance of the food is equal in importance to the taste. Eight colourful dishes were placed on each tray, ranging from two rice cake ducks, representing the bride and groom and to be taken away rather than eaten, to a bluey-green uncooked sea-

CHALLENGER'S
JUDO TEAM—
OMINATO,
JAPAN

Photo: Planet News, Lt

ARRIVING AT PORTSMOUTH FOR THE LAST TIME. COMMANDER ASHTON POSES FO
THE PRESS WEARING ONE OF CHALLENGER'S MANY 'TROPHIES'

food. Twenty-six people attired in gay kimonos, each with one of these well-provisioned trays and a bowl of fruit, sat cross-legged on the soft tatami matting, a satisfying sight. But soft as the matting floor of a Japanese house is, it soon becomes painful for Europeans to sit cross-legged, and after about three hours sitting thus the party from the ship could bear it no longer, cramped legs were stretched to the good-hearted amusement of their fellow guests. Then the singing and dancing began and limbs could really be relaxed. At 11 p.m. Challengers had their last glass of sake, said farewell and left to find their boat. Forty-eight hours later someone from the ship met Hamaya, who said that some of his friends were still keeping the party up and drinking sake.

Night after night, when work was over for the day, those of the crew who were studying judo landed and made their way through the snow-covered streets to the house of their instructor. At last came the great day when the Anglo-Japanese Amity Judo Meeting was held in the Assembly Hall. The Mayor was there, also the President of the Shimoseki Judo Association, and certainly the whole of the junior population of the town.

Dressed in judo kit—loose jacket and trousers—the members of the ship's company looked strange and unfamiliar as they formed up with their Japanese opponents on the grass judo mats. Speeches were made by all the personalities present, an oath of sportsmanship was taken and the bouts were on. The first item was a match between two Japanese, one a very small man, the other very large. Time and time again the small man hurled his opponent to the floor with a resounding crash, but each time the giant picked himself up and came slowly back for more, searching for the hold he never got.

Then followed the serious business of the evening, bouts between Challengers and the locals in which the sailors held their own, winning as many contests as they lost. Lastly one of the Japanese, a veritable champion, took on five Challengers one after the other, casting each in turn to the floor, all except the last man, Kirsopp, the officers' cook. He and one of the electricians were classed as '4-kyu', a high distinction for Europeans, and they received beautifully-illuminated certificates to prove it to those who were capable of reading Japanese.

Soon the ship moved more rapidly to Hong-Kong, Singapore and into the Indian Ocean through the Sunda Straits. Here good weather allowed a feast of seismic experiments, and scientific morale onboard rose accordingly. By now a considerable number of seismic experiments had been made in the Atlantic, Pacific and Indian Oceans, and still there were some more to be made in the Mediterranean. Tom and John had found much of interest, but possibly the fact that the earth's structure beneath the true oceans is radically different from that beneath the continents is the most striking result of seismic experiments at sea. In *Challenger* they had measured with refraction shooting the thickness of the sediment carpet on the ocean floor composed of the calcerous or silicious skeletons of countless millions of planktonic animals and plants finding a great difference in thickness from one part of the ocean to another and also between oceans. These sediments have a speed of sound through them little faster than in sea water. In the Atlantic various thicknesses were measured from 3500 feet to practically nothing, whereas a carpet depth of about 1500 feet was more usual in the Pacific.

The rate of accumulation of this sediment on the sea-bed has been measured by inspecting core samples and identifying volcanic ash strata blown over the surface of the sea from two separate eruptions in historic times, the distance between these two dark layers in the core being measured as one would measure the distance between two layers in a cream-filled cake. A little under half an inch in 1000 years seems to be a popular estimate thus obtained, but it seems doubtful if there are many places in the oceans where the carpet is laid down from sediment falling only from directly above. Sub-surface and bottom currents flowing upon as yet undiscovered courses probably carry sediment, like snow on the winds, to form drifts upon the ocean floor.

Beneath the sediments in true oceanic areas the first layer of rock would appear to be of great hardness indicated by a speed of sound of about 22,000 feet per second, which continues downwards until the earth's true crust is reached about 36,000 feet below the surface of the sea. The meeting of these two is known to scientists as a well-defined discontinuity, which under the continents is not reached until nearly 100,000 feet has been penetrated. This startling difference in structure between continental and oceanic areas would seem to suggest that the deep seas have always differed from the land masses even though water may not always have been contained in the former.

Visits to Colombo, again to the beautiful Seychelles, to Aden and Port Said and Cyprus brought the ship to the Aegean to carry out some weeks' seismic work there. Athens was first visited and then a number of the islands, including Lemnos, Skyros, Volos and the Mount Athos Peninsula. This last was of fascinating attraction, for spread about the peninsula, in the most precarious sites, sometimes over 1000 feet up on the sheer cliffs, are 20 monasteries. No form of female life is permitted anywhere on the whole of Mount Athos, over 6000 feet high. Challengers visited six of these monasteries, travelling up the steep, dusty mountain tracks on sure-footed male donkeys. On reaching the monastery all was kindness, and after a liqueur, turkish delight or coffee, the tour of the building would begin. In these remote locations beautiful domed chapels, painted with frescoes and hung with ikons, had been built. In the altar shrine at Vatopede were part of the sash worn by the Virgin Mary, a piece of the True Cross and a finger of John the Baptist; manuscripts there were too, dating back nearly 2000 years, and examples of the earliest painted works.

Escaping prisoners had sheltered in some of these monasteries during the War, and a letter of thanks from General Alexander, for kindness shown to these people, was framed at Lavra Monastery.

These delightful visits over, the parties from the ship would come out into the full glare of the sun and mount their donkeys for the return journey to the ship which they could see anchored far, far below them, a mere white speck on the rumpled blue of the sea.

The end of the World Voyage was now very near, for there were visits to be paid only to Malta and Gibraltar and then home to Pompey. The ship had travelled 75,000 miles on this voyage when she passed the Straits of Gibraltar into the Atlantic once again, and headed westward. But the old ship had different ideas, she wanted now to go straight home, with no further delay on oceanographic observations which the insatiable scientists had planned for her on this last leg. It was after she had found and surveyed a new seamount that she decided to do no more. When the engine was put ahead nothing happened, no coaxing would turn her single screw. The Engineer Officer tried everything he knew as she lay wallowing in the long swell. At long last, by giving her an immense amount of steam and opening the throttle with a rapid movement, there followed a resounding bang like a clap of thunder and she was on her way. There could be no risk of a repetition of her single screw refusing to turn while still over 1000 miles from home, so her head was turned for Pompey and the now willing old girl never stopped until she arrived safe and sound in her own Home Port, after two and a half years on the wide oceans of the world.

An oceanographic voyage remains today one of the last retreats where man may observe and study unmolested. It is well known that a captain's troubles commence when land is sighted and reach their peak as the ship is finally berthed to permit agents, authorities, customs, press and tradesmen to surge over her like an invading army, and all privacy is gone.

The peace which comes upon the commander of a deep-sea expedition as the land slowly sinks below the horizon astern and he heads for the limitless ocean is profound. The ship is clear of all but those who are there with a purpose, no telephone is connected, no unwanted midday caller will arrive; all that matters is the one job in hand, that of surveying and studying the ocean. Even the wireless office is usually silent upon such a ship, for the Admiralty sends few operational signals to a 10-knot survey ship with an extensive oceanographic programme ahead of her. There is time to think, time to stop at a moment's notice to study some passing phenomena and to remain there a day if need be to investigate the matter.

One night in the Pacific south of Japan the ship passed through a great area of sea, brilliantly illuminated, the water glowing from the ripple of the bow-wave across the gently ruffled water to the very horizon. The ship was stopped and some of the phosphorescent matter in the water was netted and placed beneath the microscope. Small spherical objects could be seen, each with a tail sticking from it. These were dinoflagellates of the form Noctiluca. Scientists have not yet decided among themselves whether this is a plant or an animal. The light given off by countless millions is a cold light producing no heat, a feat still beyond the scope of human endeavour.

One morning in the Indian Ocean John Swallow found a small squid about four inches long lying upon the upper deck. It appeared that it must have been attracted by a light on deck. It had been a flat calm night so that the surface of the sea would have been about 10 feet below the upper deck. To reach the deck, therefore, John worked out that this small squid must have been swimming at about 27 miles an hour before it left the water.

In the Atlantic a hawk sat quietly in the rigging, over 1000 miles from land. It watched the storm petrels fluttering in the ship's wake and of a sudden left the mast as it would a tree in the English woodlands, and swooping upon its prey took and devoured a petrel.

Few ships were ever seen upon the voyages *Challenger* made in the course of her search for knowledge of the sea-floor; she was guided by the shape of the sea-bed rather than the trade routes.

The moon rising above the horizon like a ship on fire; the stars so bright on a calm tropic night that silver threads ran beneath them over the dark sea; the green flash from the setting sun; the windrows and the calm unaccountable swathes upon the surface of the sea when a gentle breeze begins after calm; the great fleets of Velellas, pale white and blue, their sails set, and all sailing purposefully before the Trades; the dolphins racing before the ship's stem one above the other, turning upon their backs to show their white bellies in pure ecstasy of enjoyment; the steady, relentless progress of a giant swell generated by a distant storm, passing across the surface of the sea; golden rafts of algae being the species Trichodesmium, recognisable under the microscope as a neat little bundle of sticks: these are the things one has time to regard and time to ponder on when passing unhustled across the face of the ocean.

Challenger's arrival at Portsmouth was not quite the end of the story. She paid off and took on a new crew for a last short commission to carry out a series of seismic and sounding cruises in the North Atlantic in an attempt to learn more of the topography and construction of that great range of submarine mountains known as the Mid-Atlantic Ridge. She sailed on her usual three-week cruises, returning alternatively to Londonderry or Portsmouth for fuel. She paid one visit to Punta Delgada, her last foreign port of call, where on this occasion the men could get onshore to enjoy the delights withheld from their predecessors of 1942; and in the terrible gale at the end of January, 1953, she was in the Shetlands again after so many years, riding out the winds of 100 miles an hour, nearly the whole complement of her officers and many of her crew suffering from raging influenza. She lost a boat alongside in this terrible weather. Divers who were flown up from Rosyth when the wind moderated were able to recover this craft within a day or so.

The spring and summer of 1953 were unpleasant, gale after gale swept the North Atlantic and the old ship lay many days hove to, her old bones creaking as she rose and fell. One great wave, 50 feet or so in height, rolled towards her. Those on the bridge held their breath and stared, then it broke over her quarter, making her falter as she rose to it and breaking and scattering her boats stowed on the quarter-deck. But steadily she battled through that last stormy summer in the North Atlantic and in September sailed into Portsmouth, and paid off for the last time.

As she had taken over from the old *Iroquois* over 20 years before, so now another new survey vessel was ready to take her place. *Vidal* was complete at Chatham, a fine modern vessel with every piece of up-to-date surveying equipment, including a helicopter for landing survey parties upon the mountain tops, and a complete chart reproduction outfit of the latest type, far removed from *Challenger*'s old flat-bed press that she had carried with the Eastern Fleet. How many surveyors had spent happy and adventurous days in this well-loved ship! Each remembered the ship as he knew her—white and spick and span anchored off a tropic island in her early days in the Caribbean, the trade wind bringing the scent of the land; grey and drab in war time, fighting a gale in northern waters, the wind stinging the eyes of those upon the bridge; camouflaged and curious, nosing through the reefs of Torres Strait, the breeze warm as the blast from a furnace.

The author remembers her far out on the Pacific, a blue dome of sky above, great depths beneath, a white speck in an empty world. It is the forenoon onboard and the lifebeat of the vessel's pulse comes from below as her engines push her ahead through the long low swell; other sounds come racing back, the gentle flap flap of the bridge awning in the breeze, the shrill of the boatswain's call and the song of a sun-tanned seaman at work on deck. And smells, too, are there—freshly applied paint, tarred hemp and the tang of navy rum which pervades the little ship at noon. The cook is in his gleaming galley, serving out the dinners, his white chef's hat above a beaded brow; the quartermaster, stripped to the waist, stands at the wheel; the navigator is taking his midday sights upon the bridge; while on either bow flying-fish skim away from the oncoming vessel.

For a time there was talk of a reprieve for the dear old ship; she might become a drill vessel for the Royal Naval Volunteer Reserve. She was inspected with this end in view but she was done; her hull had worn paper thin below, the upperworks were rusting beyond repair, and rust too was thrusting its way through the timbers of her deck. Twenty-two years is not a great age for a ship, but she had lived hard.

'Approval has now been given for H.M.S. *Challenger* to be handed over to the British Iron & Steel Corporation for scrap', ran Admiralty Acquaint Notice 4195, dated 7th December, 1953. Blunt and materialistic was the epitaph written by those who had never known her, but *Challenger*'s true epitaph is carried in the titles of her many charts.

Appendix

CHALLENGER'S CAPTAINS

(Ranks and decorations when holding the appointment)

1931–32	Lieutenant-Commander E. H. B. Baker
1932	Captain A. L. Jackson
1932–35	Commander A. G. N. Wyatt
1935–37	Commander Alun Jones
1937–39	Commander E. H. B. Baker
1939–42	Commander W. C. Jenks, O.B.E.
1942	Lieutenant-Commander R. Bill, D.S.O.
1942–44	Captain A. G. N. Wyatt
1944	Lieutenant-Commander R. Bill, D.S.O.
1944–46	Commander C. W. Sabine, O.B.E.
1946–48	Captain R. M. Southern
1948–49	Commander J. M. Sharpey-Schafer
1949–50	Commander R. Bill, D.S.O.
1950–51	Commander G. S. Ritchie, D.S.C.
1951–53	Commander W. Ashton, D.S.C.

Index

(* Denotes Captains of H.M.S. *Challenger*)

Abadan, 162
Abel, Stoker Mechanic, 195–196, 219
Aberdeen, 101
Aberdeenshire, 7
Achpitok Island, Labrador, 14, 55
Adak, Aleutians, 203
Addison, Dr., Minister of Agriculture and Fisheries, 2
Addison, Miss, 2
Addu Atoll, 128
Aden, 163–164, 169
Aegean Sea, 237
Africa, East, 127, 129, 134, 169
Africa, West, 105, 112, 124, 127, 129
Agriculture and Fisheries, Ministry of, 1–3
Al Bushirya, Persian Gulf, 159
Albatross, varieties of, 204–205, 209–210
Albatross expedition, 186, 188
Albreda, Gambia River, 120–121
Alert Bay, B.C., 198
Aleutian Islands 203
Allack, Job, 49
Angoorli, Mr., 163
Anselm, s.s., 106–110
Antarctic Ocean, 55, 225–226
Arakan coast, 140–142
Arctic Ocean, 225
Argus, H.M.S., 94
*Ashton, Lieutenant-Commander W., R.N. (later Commander), 163–168, 171–173, 176
Athens, 237
Athos, Mount, 237
Atlantic Ocean, 7–9, 113, 123, 190–193, 226, 236, 237, 239–240
Auckland, New Zealand, 208, 219
Aulatsevik, Labrador, 16, 52, 59
Azores, 111

Baffin Bay, 225
Baffin Land, 56
Bahrein, 77, 156–159, 162, 168, 177, 178
Bahrein, Sheikh of, 77, 157
Baillie apparatus, 226–227, 229
*Baker, Lieutenant-Commander E. H. B., R.N. ('Buck') (later Captain), 2–5, 26, 36–37, 39–43, 45–49, 51–53, 55–59, 72, 76, 81, 209
Balfour, Captain Andrew, R.N., 227, 232
Baltic Sea, 186
Banda, 152
Banks, Mr., 146
Barbados, 72
Barbour, Able Seaman Harry, 99–100
Basra, 162–163
Bathurst, 106, 113–114, 122–123
Beagle, H.M.S., 143
Bean, Miss Lucy, 135
Belle Isle, 11
Bengal, Bay of, 128
Bennett, Sam, 198
Bermuda, 71, 190–193
Big Bay, Labrador, 56
*Bill, Lieutenant-Commander Robin, R.N. (later Commander), 127, 137, 147, 190
Bingham, Surgeon Lieutenant-Commander E. W., R.N. ('Doc') (later Surgeon Captain), 26, 32–33, 36–37, 42–43, 45–46, 49, 53, 55–56
Black Bear Island, Labrador, 11
Black Island, Labrador, 52
Black Point, Labrador, 56
Blackwall, East India Dock, 101
Blackwood, Captain, 146
Bombale Kana, Gambia River, 121
Booby Island, Torres Strait, 146, 151–152
Borneo, North, 155
Bridges Run, Labrador, 54–55
Bristol Channel, 86
British Columbia, 195–200
Brooke apparatus, 226
Brunei Bay, 155
Buchan Deep, 7
Buck, Sir Peter, 202
Burma, 137, 155

Cairo, 77
California, University of, Scripps Institute of Oceanography at, 194, 232
California Standard Oil Company, 77
Cambridge, University of, Department of Geodesy and Geophysics at, 186
Canada, 91, 182
Cape Harrigan, 13, 23
Cape Johnson, U.S.S., 228
Cape Johnson depth, 228
Cape of Good Hope, 113, 127–128, 134–136
Cape Town, 133, 135–136

Cape York Peninsula, 146
Caribbean Sea, 72, 240
Carriacou, 27–30, 58, 60–61, 65
Cartwright, Labrador, 32, 58–59
Cathay, merchant cruiser, 110–111
Celerol, H.M.S., 71
Central Island, Labrador, 52
Ceylon, 24, 128, 136, 144, 155; Survey of, 137
Challenger, H.M.S.: Captains, *see* Ashton, Baker, Bill, Jackson, Jenks, Jones, Ritchie, Sabine, Sharpey-Schafer, Southern and Wyatt; planning and construction of ship, 1–2; launching and naming, 2–3; first crew, 3–5; equipment, 4–7, 57, 84, 148, 178; 'bottling stations', 8–9; Labrador survey, 8, 11–23, 26, 30–59, 60; West Indies survey, 26–30, 57–58, 60–70; Trinidad surveys, 70–72; Arabian survey (Muhammad Qol), 73–82; war channels survey, 83–84; Thames tidal stream survey, 84; armaments fitted, 84; Scottish survey, 85–90; Icelandic survey, 90–97; voyage in convoy to East India Dock, 98–101; in bombardment of London, 101–103; refits, 101–103, 124, 133–136, 145, 163, 167, 177, 208; Londonderry surveys, 103–104; voyage to West Africa and Battle of the Atlantic, 105–112; Gambia River survey, 113–123; Indian Ocean surveys, 125–144; Torres Strait survey, 147–155; Trincomalee survey, 155; Singapore survey, 155; Saigon, Hong-Kong, North Borneo and Sarawak surveys, 155; Persian Gulf surveys, 156–177; in Cyprus, 163, 167, 237; Cyprus survey, 178–184; seismic experiments, *see under*; world cruise begins, 185–190; in Bermuda, 190–193; in Kingston, Jamaica, 193; in San Diego, 194; in British Columbia, 195–200; in Hawaii, 201–203; in North Pacific, 203–206; in Japan, 206–207, 233–235; *en route* to Aegean, 237; voyage home to Portsmouth, 237–240; ship paid off, 240; handed over for scrap, 241; Royal Marines in, *see* Crowford, Laws and Lyons
Challenger expedition of 1872–1876, 1, 202, 215, 226–227
Challenger Cove, 43
Challenger Rock, 23
Chatham, 1, 3–4, 139, 158, 188, 190, 240
Chidley, Cape, 11
China Sea, 137
Chinnco, Lt. William, R.N., 25
Chittagong, 140
Clarke, Captain, 10–11, 14
Clarke, Mr., of Hudson Bay Company, 31, 39, 42
Clarke, Mrs., 39
Clausing, Captain, of California Standard Oil Company, 77
Clyde, 86, 106
Cockade, H.M.S., 163
Coconut Island, Torres Strait, 154
Cocos-Keeling Islands, 142–144
Cole, Lieutenant-Commander, R.N.R., 133
Colombo, 128, 136–139, 143–144, 155, 237
Connell, Lieutenant T., R.N. (later Captain), 92
Contest, H.M.S., 163
Cook, Captain, 146, 151, 209
Cooper, Surgeon Lieutenant W. A. B., R.N.V.R., 109
Coral Reef Committee, Royal Society's, 215–217
Cornwall, H.M.S., 128
Cornwallis, s.s., 65
Cox's Bazaar, Arakan coast, 140–142
Croome, Lieutenant E. E., R.N. ('Trapper') (later Lieutenant-Commander), 143–144, 161, 163
Crowford, Sergeant, R.M., 126, 131, 133, 135, 139
Culmore, 103–104
Curaçao, H.M.S., 98
Currents, ocean system of, 7–8, 63–64
Cypress Sands, Naaf River, 140–141
Cyprus, 163, 167, 178–184, 237

Daimmiyat Islands, Persian Gulf, 158
Dakar, 113, 120, 232
Dalrymple Island, Torres Strait, 146
Dampier, Seaman, 7
Darwin's atoll construction theory, 143, 215–216, 224
Davis Inlet, Labrador, 14, 30, 56
Dawa, Head Man of, 76
Deane, Lieutenant Dennis W., R.N. (later Lieutenant-Commander), 26, 36, 40–43, 45–47, 49, 51–52, 56, 58, 60
Dehra Dun, 137
Delhi, 140
Denham, Captain H. N., R.N., 25
Denmark Strait, 96
Devil Point, Gambia River, 121
Devonport, 4
Devonport, New Zealand, 228
Doctor Forbes Air Survey, 19

Dog Island, Labrador, 14
Dogo, Matsuyama, 206
Doha, Qatar, 157–160, 164–165, 167, 169, 172, 177
Dohat as Salwa, Bay of, 157, 177
Dominica, 70
Domino Run, 23
Dorsetshire, H.M.S., 128
Douglas, Rear-Admiral H. P., 1
Dover, 83
Dungeness, 84
Durraween, H.M.A.S., 147

Echuca, H.M.A.S., 148
Edgell, Vice-Admiral Sir John, 103, 123, 147
Egeria, H.M.S., 197–198
Egypt, 74–75
El Alito, oil tanker, 86
Ellice Islands, 214–224
Elliott, Captain Andrew, Merchant Navy, 110 and n.
Emden, German ship, 228
Endeavour, H.M.S., 124
Engby, s.s., 142
English Channel, 6
Ephraim, 47
Erebus, H.M.S., 225
Eros, s.s., 98–101
Essau, Gambia River, 119–120
Esther, river steamer, 140–141
Europa Island, 129
Evans, Dr., 212
Eyjafjord, Iceland, 96

Fadiffolu Atoll, 138–139
Fair Isle Channel, 7
Famagusta, 179–180
Fao, 162
Farmyard Islands, Labrador, 13
Faroes, 89–90, 96
Fasht al Arrif, Persian Gulf, 157–159, 161, 164
Fasht al Odaid, 161
Fiji, 210–211, 213
FitzRoy, Captain, R.N., 143
Flinders, H.M.S., 60
Fly, H.M.S., 146–147, 151–152
Fongafale, Ellice Islands, 214, 219
Ford, Joe, 53
Ford, Willie, 53
Ford's Harbour, Labrador, 20, 22, 31
Formidable, H.M.S., 128
Fort Garry, Hudson Bay Company schooner, 56
Franklin, H.M.S., 90–91
Fraserburgh, 101
Freestone Islands, Labrador, 14
Freetown, 111
Friday Island, Torres Strait, 154
Fry, Amos, 56
Funafuti, Ellice Islands, 214–220, 223–224

Galatea, Danish research ship, 228
Gambia, 114, 120
Gambia River, 106, 113, 115–122
Gaskell, Dr. T., 189, 200, 206, 217, 220, 222–224, 225, 233, 236
Gibraltar, 73, 163, 167–168, 177, 237
Gillingham, Mr., 43, 45–46
Goo, Mr. Ducky, 202
Good, H., Lieutenant Engineer, R.N., 23
Goolgwai, H.M.A.S., 147
Gordon, Lieutenant-Commander D. L., R.N. ('General') (later Commander), 93, 102–103, 134, 163–164, 180–184
Graham Island, B.C., 196
Grattan, Lieutenant Charles, R.N. (later Commander), 140–141, 158, 161, 163
Greenock, 105
Greenshields, Petty Officer J. (later Chief Petty Officer), 127, 140–142, 189, 229
Grenada, 27–28, 58, 65, 67–69
Grenadines, 26–30, 57–58, 60–70
Grenfell Mission, 13, 32
Griffiths, Lieutenant R. H., R.N. (later Lieutenant-Commander), 61
Grubb, Mr., of Moravian Mission, 31, 39, 42, 52, 56
Grubb, Mrs., 39
Guardian, H.M.S., 90

Halifax, 20, 23, 30, 33, 58–59
Hall, Lieutenant G. P. D., R.N. (later Commander), 93, 95–96
Hamaya, Japanese interpreter, 233, 235
Hampson, Leading Seaman, 36
Hare, Mr., 143
Harvey, M., Lieutenant-Commander (S), 165
Harwich, 83
Hat Islands, Persian Gulf, 159–160
Hawaii, 200, 201–203
Hay, Lady, 162
Hay, Sir Rupert, 158, 162
Hebron, 42–43, 47–50, 51
Heliotrope, H.M.S., 23
Hen and Chicken Islands, Labrador, 59
Herald, H.M.S., 25
Hermes, H.M.S., 128
Hess, Dr. H. H., 228
Heysham, 127, 151
Hillsborough, Carriacou, 30, 58, 60
Hilo, Hawaii, 202
Hiroshima, 207

Hofdi promontory, Iceland, 92
Holgate, Officers' Steward, 36
Hong-Kong, 91, 155, 233, 236
Honolulu, 201–203; Bernice P. Bishop Museum at, 202
Honshu, 205, 233
Hood, H.M.S., 96
Hope, Stoker Mechanic, 194–196, 219
Hopedale, Labrador, 11, 13, 33, 55–56
Horizon, U.S.S., 232
Horta, Azores, 111
Houot, Lieutenant-Commander Nicolas, French Navy, 232
Hoxa Sound, 90
Hrutafjord, Iceland, 96
Hudson Bay Company, 30–31, 36, 39, 42, 46–48, 56, 197
Humber, 83
Hurricane 'Doris', 191
Hurricane 'Effie', 192–193
Hvalfjord, Iceland, 90–92, 94, 96
Hydrographer of the Navy, 1–2, 7, 24–26, 103, 123; *see also* Douglas, Edgell, Southern (Assistant Hydrographer) and Wyatt

Iceland, 37, 89–97, 98, 102, 104, 127
Iceland-Faroe Channel, 96
India, 136, 162; Survey of, 137
Indian Harbour, Labrador, 11
Indian Ocean, 125–144, 146, 155, 178, 236, 239
Invergordon, 98
Iraq Petroleum Company, 157–158
Irish Sea, 86
Iron Bound Islands, Labrador, 13
Iroquois, H.M.S., 4, 240
Islay, Sound of, 87
Itibliasuk, Labrador, 47, 49

*Jackson, Captain A. L., R.N. (later Rear-Admiral), 5, 7
Jane Victoria, schooner, 65
Japan, 205–206, 225, 229, 233–235
Japan Trench, South Pacific, 226, 228, 232
Japanese Fleet, 128, 136, 140
Jazirat Safliya, Qatar, 165
*Jenks, Commander W. C., R.N., 84–87, 91–93, 95–97, 99, 101, 103–110, 114–115, 117–121, 124, 127
Jesselton, 155
Jezirat Halul, Persian Gulf, 167, 178
*Jones, Lieutenant-Commander Alun, R.N. (later Commander), 60, 64–65, 68–70, 72

Kamaran, Red Sea, 169
Kandy, 137
Kasban Creek, Gambia River, 121
Kauk Harbour, Labrador, 33
Kayaksuatlik, Labrador, 13
Kermadec Trench, South Pacific, 209, 227, 232
Khamis bin Hilal, Sheikh of Masira, 75–76
Khor, 169–172; Sheikh of, 172–173, 176
Khor Kaliya, 77
Khor Shaqqiq, 169–170, 177
Kidlialiut, Labrador, 13
Kiglerpait Mountains, Labrador, 43, 45, 49–50
Kikkertaksoak Islands, Labrador, 13
Kikkitavak, Labrador, 15
Kilauea, Hawaii, 202
Kilindini, 128–129, 131, 133–135
Kingston, Jamaica, 193–194
Kingstown, St. Vincent, 65, 67–69
Kinkujung, Gambia River, 119
Kinnaird Head, 98
Kirsopp, Officers' Cook, 235
Kirkwall, 87, 89
Kofe, Chief Clerk, 215, 220
Kristiansson, Bragi, 91–92
Kruger Island, Labrador, 40
Kuching, 155
Kunghit Island, B.C., 195–196
Kunkudella, Gambia River, 119
Kuntaur, Gambia River, 121–123
Kutallik Island, Labrador, 14
Kure, Honshu, 205, 233
Kuril Islands, 226
Kurukuluk, Labrador, 45–46, 49
Kyle, Newfoundland steamer, 32, 55–56, 58–59
Kyle Akin, 89
Kyrenia, 183

Labrador, 7–8, 10–23, 26, 28, 30–59, 60, 91, 127, 147, 200
Labuan, 155
Latra Sibige, Gambia River, 119
Lavender, H.M.S., 105
Laws, Corporal, R.M., 126, 131–133, 135, 139
Learmouth, Captain, R.N. (later Rear-Admiral), 198
Leeward Islands, 72
Limassol, 180–181
Little Martinique, 28
Little St. Vincent, 28, 58, 64
Liverpool Bay, 86
Lizard, 86
London, bombardment of, 102–103
Londonderry, 103–104, 124, 240
Long, Petty Officer Charles (later Chief Petty Officer), 127, 137, 145
Lough Foyle, 103

Lough Larne, 104
Lucas, 45
Lyons, Corporal, R.M., 126, 131–133, 135, 139

Macmillan, 56
Mahé, Seychelles, 136–137
Malacca Straits, 137
Malaya, 136, 155
Malta, 237
Manama, Persian Gulf, 77, 159
Mandinari, Gambia River, 119
Manus, New Guinea, 207, 222, 225, 229
Manza Bay, 133
Marianas Trench, South Pacific, 224–226, 228, 230, 232
Marie Louise Mackay, cable ship, 86
Marlowe, Able Seaman, 36, 41, 52
Marshall, Able Seaman (later Chief Petty Officer), 36, 39
Mary Nolander, schooner, 56–57
Masira Island, 75, 77
  Sheikh of, *see* Khamis bin Hilal
Massie, Mr., 47–48
Matthews, Dr. D. J., of Hydrographic Department, 8
Mauna Loa, Hawaii, 202
Maungdaw, 142
Maury, Lieutenant, U.S.N., 226
Maury, U.S.S., 168
Mayatib Island, Red Sea, 80
McKenna, Able Seaman Charles, 99–100
Mediterranean Sea, 74, 113, 178, 185, 232, 236
Medway, 103, 125
Mendora Creek, Gambia River, 121
Menzies, Lieutenant-Commander Henry, R.N. (later Captain), 70, 105
Mesquite, U.S.S., 155
Metcalfe, Willie, 46–47
Milford Haven, 89
Miller, Surgeon Lieutenant Sloan, R.N., 76–77
Minnie B., American schooner, 32
Monaco, International Hydrographic Bureau at, 9
Mokkovik Island, 13
Mombasa, 131, 133, 135
Monro, Squadron Leader, 109
Montrose, H.M.S., 86
Moore, Sub-Lieutenant J. E., R.N. (later Commander), 131, 232 n.
Moravian Mission, 39
Moray Firth, 98
Moresby, H.M.A.S., 147
Mortimer Shoal, Labrador, 12–13
Motor Launch No. 1248, 144
Mountbatten, Lord Louis, 142
Mozambique Channel, 129, 134
Muara, 155
Mugford Range Mountains, Labrador, 47
Muhammad Qol, 79–82
Mulgrave, Lord, Arctic Expedition of 1773, 225
Mull, Sound of, 87
Murray's atoll construction theory, 215–216
Muscat, 75, 79, 156
  Sultan of, 75

Naaf River, 140–142
Nain, 11, 13, 16–17, 20, 30–33, 35–36, 38–44, 48–53, 55–56, 58–59
Nanpo Shoto Islands, 204
Nathan, 45
Natural History, British Museum of, 230
New Caledonia, 208
New Guinea, 146, 207
New Zealand, 208–209, 227–228
Newfoundland, 7, 10–11, 16, 23, 32, 56, 58–59
Newfoundland Bank, Great, 190
Nguva, H.M. Yacht, 144
Nianmaru, Gambia River, 121
Nicosia, 181–182
Niumi, Lower, 119–120
  Seyfu of, *see* Nomandu Sonko
Niumi, Upper, 120
  Seyfu of, 120
Noazunaluk, Labrador, 52
Nochalik, Labrador, 14
Nomandu Sonko, Seyfu of Lower Niumi, 119–120
Nore, The, 3
North Sea, 7
Norway, 89
Nova Scotia, 30
Nukufetau, Ellice Islands, 220, 223–224
Nunaksaluk, Labrador, 13
Nutak, Labrador, 42–43, 46–47, 49
Nuvutannak, 58

Oahu, Island of, Honolulu, 202
Oman, 75–76
Ominato, Honshu, 233–235
O'Neill, Lieutenant B. G., R.N. (later Commander), 93, 95, 99–100
Oom, Lieutenant-Commander Karl, R.A.N. (later Commander), 147
Orkneys, 87
Owen, Captain, R.N., 121

Pacific Ocean, 7, 146, 194, 201–205, 208, 210, 214, 227, 228, 230, 232, 236, 238, 240–241

Paisley, Lieutenant J., R.N. (later Lieutenant-Commander), 115–116
Palk Straits, Indian Ocean, 136, 142
Palungitak Island, Labrador, 15
Panagonjak, Ama, 43, 45
Panama Canal, 72, 194
Paria, Gulf of, 70, 72
Parkivik Point, Labrador, 46
Patricia, Trinity House vessel, 84, 96
Paul Island, Labrador, 15–16
Pearl Harbour, 201, 203
Penguin, H.M.S., 215, 227
Pentland Firth, 98
Persian Gulf, 156–167, 168–177, 178–179, 185
Peters, Hudson Bay Company trader, 56
Pettersen, Professor Hans, 186
Petunia, H.M.S., 105
Philippine Trench, South Pacific, 228, 232
Piccard, Professor Auguste, 232
Planet, German ship, 228
Plymouth, 6, 84–86, 89
Polaris, seine net fishing vessel, 147
'Port A', West Coast of Scotland, 85–87, 89
Port Manvers, 16–17, 59; Port Manvers Run, 16–17, 19, 35, 43, 59
Port of Spain, Trinidad, 30, 71–72
Port Reitz, 129
Port Said, 74, 237
Port Simpson, B.C., 197–198
Port Victoria, Seychelles, 136
Portavogie, s.s., 86
Portsmouth ('Pompey'), 3–5, 7–8, 23, 34, 57, 59, 67, 70, 72, 82, 89, 155, 188, 237–240
Portsmouth, W.I., 70
Preston, Surgeon Lieutenant F. S., R.N.V.R. (later Surgeon Lieutenant-Commander), 164–165, 176
Prien, Lieutenant-Commander, German Navy, 90
Puerto Rico, 72
Punta Delgada, 111, 240
Pyrgos, 183

Qatar, 156–161, 164–165, 167, 170, 177, 179
  Sheikh of, 77, 156–159, 172
Quebec, 59
Queen Charlotte Islands, B.C., 195–196

Ragged Islands, Labrador, 11
Ramapo, U.S.S., 228
Ramzam, Hassan, 76
Ras at Tannura, 77, 79, 157
Red Sea, 4, 79–80, 169, 179
Reher, Mr., 217, 219
Repulse, H.M.S., 96
Revelle, Dr., 194
Reydarfjord, Iceland, 96
Reykjavik, 91, 94–97
*Ritchie, Commander G. S. (later Captain), 182, 190–192, 197–199, 201–202, 206–213, 215–222, 230, 240
Rizo-Karpaso, 182–183
Rookah Channel, Persian Gulf, 162
Ross, Captain, 143
Ross, Sir James Clark, Antarctic Expedition of 1839–1843, 225–226
Ross, Sir John, Baffin Bay voyage of 1817–1818, 225
Rosyth, 240
Rotuma, 210–213
Royal Oak, H.M.S., 87, 90
Round Island, Torres Strait, 152
Rutherford, Surgeon Lieutenant P. T., R.N.V.R. (later Surgeon Lieutenant-Commander), 160, 164, 181–182

*Sabine, Commander C. W., R.N., 151
Sabine, tug, 101
Saigon, 155
St. George's, Grenada, 27–28, 58, 65, 67, 71
St. James Island, Gambia River, 121–122
St. John's, Newfoundland, 7, 10, 16, 32
St. Lucia, 69
St. Martin's Island, Indian Ocean, 141
St. Vincent, W.I., 65–69
Salekine Point, Gambia River, 121
Samuel Benbow, H.M.A.S., 147
San Diego, 194
San Miguel, 111
Sararat, 80
Sarawak, 155
Satosoakkuluk, Labrador, 38
Saudi Arabia, 77, 157, 168
Scaale Fjord, Faroes, 90
Scapa Flow, 87, 89–91
Scotland, West Coast of, 85–86, 89
Scott, H.M.S., 84
Scripps Institute of Oceanography, *see* California
Seismic experiments, 186–188, 215–216, 222–224, 225, 236–237, 239
Senegal, 114, 121
Seychelles, 136–138, 237
Seydisfjord, Iceland, 96
Seymour Narrows, B.C., 198
*Sharpey-Schafer, Commander J. M., R.N., 111–112, 168
Shatt el Arab, 162
Sheerness, 84, 103, 124–127
Shetlands, 89–90, 240
Shikoku Island, 206

Shoal Tickle, Labrador, 56
Simeon, Lieutenant-Commander G., R.N., 182–184, 195
Singapore, 155; Keppel Harbour, 155
Sitrah, Persian Gulf, 158
Smith, Mr., Hudson Bay Company trader, 42–43, 45–46
Sombrero Channel, 72
Somerville, Admiral Sir James, 5, 6, 129
Soulsby, Leading Sick Berth Attendant, 189, 196, 219
Southampton, 73
*Southern, Captain R. M. ('Sam'), R.N., 158–161, 164, 167–168, 179–180, 182
Spithead, 89
Spracklings Island, Labrador, 14
Start Point, 85
Starwort, H.M.S., 105, 109, 111
Stevenson, Petty Officer, 26, 36, 42–43, 45, 49
Striped Island, Labrador, 13
Stuart, Rear Admiral C., 134
Suez, Bay of, 75
Suez Canal, 74
Sullom Voe, Shetlands, 89
Sumatra, 142
Sunda Straits, 236
Suva Fiji, 210
Swallow, John, 189–190, 205, 222, 224, 225, 236, 239
Switha Sound, 90
Sydney, 145, 147

Table Bay, 128
Taktok Tickle, Labrador, 15
Tangier, 168
Taunton, Hydrographic Supplies Establishment at, 126
Te Aute, Hawkes Bay, N.Z., 208
Tek Naaf, Naaf River, 140, 142
Telemachus, H.M. Submarine, 232 n.
Terror, H.M.S., 225
Thames Estuary, 83–84
Thompson, Colonel, 169
Thomson, Lieutenant J., R.N. (later Lieutenant-Commander), 151–154
Thursday Island, Torres Strait, 148, 151, 154
Tilbury, 103
Tikkerasuk Light, Labrador, 13, 43
Tobago Cays, 60
Tobermory, 127
Tokyo Bay, 204
Tonga Trench, South Pacific, 232
Torch, H.M. Steam Tender, 25
Torres Strait, 146–154, 240; North-East Channel, 147, 148, 153–154; Prince of Wales Channel, 148
Trincomalee, 128, 136, 139–140, 144, 155
Trinidad, 30, 58, 65–66, 70
Trinity House, 83–84, 96
Tripp, Lieutenant-Commander R. T., R.N. (later Commander), 138, 147
Trucial Coast, 156, 158
Tuglavina, Renatus, 42–43, 48–49, 51, 58–59
Tuglavina, Willie, 47, 49
Tuktuinak Islands, Labrador, 14
Tunnungayualuk, Labrador, 14
Turkey, 183–184
Turnaviks, Labrador, 13
Tuscarora, U.S.S., 226
Tyrell Bay, Grenadines, 65

Udlik Point, Labrador, 46
Ukasiksalik Island, Labrador, 14
Ulgoklialuit Island, Labrador, 13
Umm Said, 164, 177

Vancouver Island, 195, 198–200
Venezuela, 70
Victoria, B.C., 189, 199
Vidal, H.M.S., 240
Vigilant, H.M.A.S., 147
Virgin Islands, 72
Voisey, Amos, 56–57
Voisey, Henry, 36, 43, 45–46, 51–52
Voisey, John, 55

Waldo, 55
Warspite, H.M.S., 128
Watts, Major, 75–76
Webeck Harbour, Labrador, 11
West Indies, 8, 23, 26, 70, 72
White Bear, H.M.S., 145, 155
Wight, Isle of, 73
Willebord Snellius, Dutch ship, 228
Willingara, Gambia River, 119
Willm, Engineer Henri, French Navy, 232
Windward Isles, 27, 65–66, 69, 72; Governor of, 27, 65, 69
Windy Tickle, Labrador, 13, 56
Winter, seine net fishing vessel, 147
Wiseman, Dr. J. D. H., 230
Wrecked Boat Island, Labrador, 13–14
Wren, H.M.S., 164
*Wyatt, Admiral A. G. N. (later Sir Guy), 7, 10, 13–14, 20, 23, 26, 32, 57, 60, 127, 129–134, 136–139, 142, 145, 147, 158
Wyre Lighthouse, Heysham, 151
Wyville Thomson, Dr. (later Sir), 176

York Harbour, Newfoundland, 23

Zubara, Fort, Persian Gulf, 159